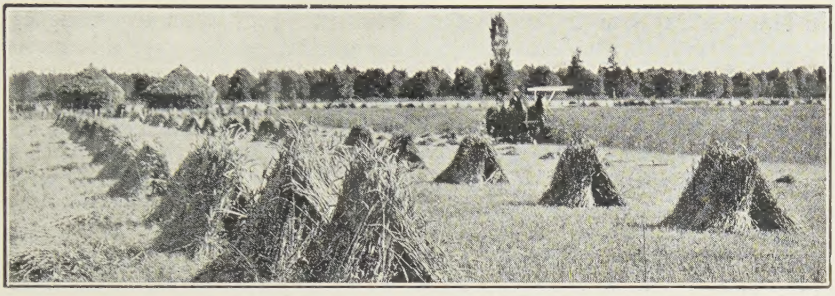

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THE NORTHERN GUM LANDS.

RECENT OPERATIONS AT PUWERA AND ALBANY EXPERIMENTAL AREAS.

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IN the *Journal* for May, 1921, an account was given of operations carried out at the Puwera Experimental Area, eight miles from Whangarei; and some of the work done at the Albany Area, near Auckland, was also referred to. It was pointed out that as "gum-land" soils varied so much in character it was necessary to group them into classes. The type represented by the Puwera Area (which is about 100 acres in extent) is heavy pipeclay with ironstone present, and is regarded as the poorest of gum soils. Albany represents a better class of soil, and is typical of a considerable area of gum-land country. The scope of the present article does not include types such as swamp lands which contain gum, or from which gum has been taken. There are considerable areas in North Auckland which can be classed under this heading. The kauri peat swamps can be treated successfully and brought into profitable use, there being no unknown difficulties connected with such types of land. Nor, again, are the sandy areas here referred to.

The general aim in connection with the gum-lands experimental areas has been to establish the best permanent pasture possible under the conditions, and to grow special crops which will enable a farmer to use the pasture to the best advantage. Crops such as swedes, turnips, kohlrabi, kale, rape, maize, sorghum, millet, oats, barley, and vetches have been successfully and economically grown. Good pasture has been established at Puwera and Albany, consisting of rye-grasses, cocksfoot, crested dogstail, brown-top, and clovers, with paspalum getting stronger each year and spreading throughout the sward. Paspalum, associated with white clover, Lotus major, and Lotus angustissimus, is considered to be most suited as the main grass in the pastures for North Auckland. The trials have accordingly been planned with the object of getting a pasture with paspalum as the chief constituent. The fodder crops grown should supplement the paspalum pasture, if such can be established and maintained profitably.

PASTURE TESTS AT THE PUWERA AREA.

The area under pasture at Puwera has been increased by 27 acres since the publication of the previous report. In addition to the ploughed area some surface-sowing after a burn has been carried out on the flat in Field 7, which is below Field 3B (see plan). On the hill in Field 4, which is very steep, a cheap surface-sown mixture of grasses, including danthonia, paspalum, brown-top, and Chewings fescue, has been put down after burning the scrub. In the nursery further experiments have been carried out with untried plants, and some results of promise have been secured.

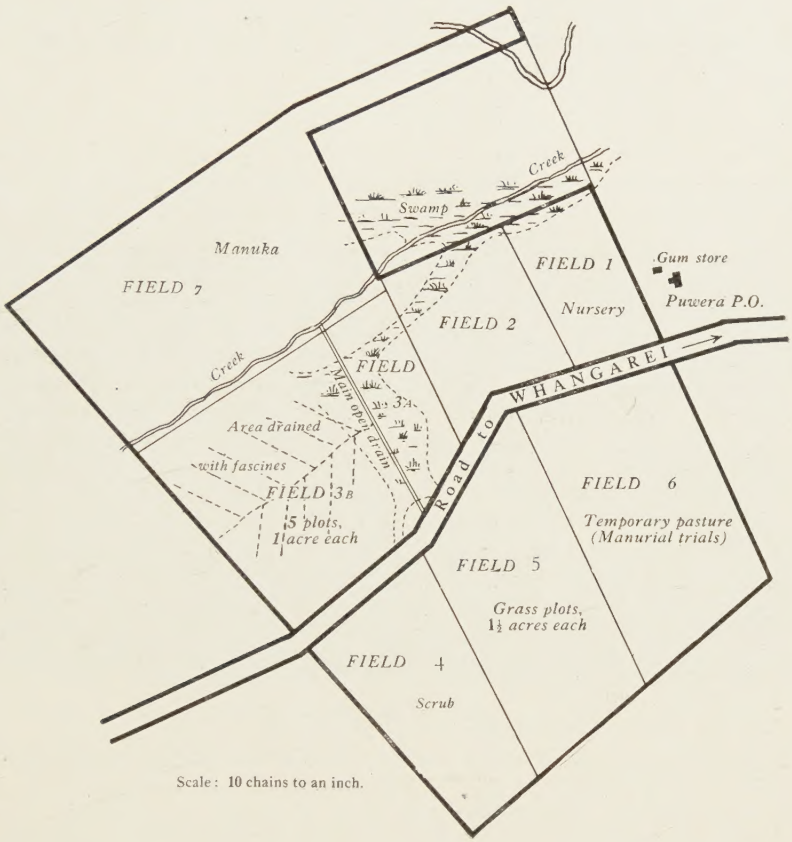
Field 3A (10 acres).

This field was prepared by cutting the manuka and other growth and burning it off. The area was rough, and needed considerable drainage on the lower-lying parts. It was full of gum-holes, 3 ft. to 4 ft. deep, and these were filled in. It was ploughed, fallowed, drained with manuka fascines, and 5 acres of it set out in plots, each plot being 1 acre in area. For details of the preliminary treatment of these plots readers should look up the May, 1921, *Journal* report. The whole field, except plot 5, was limed and subsoiled before sowing down in the following seed-mixture: Poverty Bay rye-grass, 16 lb.; Italian rye-grass, 4 lb.; paspalum (Australian seed), 5 lb.; Waipu brown-top, 1 lb.; cow-grass, 4 lb.; white clover, 3 lb.; Lotus major, 1 lb.: total, 34 lb. per acre. The sowing was done on 9th May, 1921, and 3 cwt. per acre of equal quantities of superphosphate and basic slag was applied at the time of sowing. The take was particularly good, though the seed was late-sown.

The pasture was grazed during the first season as follows: Sixteen cows in milk for twenty-three days, forty-three sheep for thirty-eight days, and thirteen head of cattle (twelve steers and one cow) for fifty-eight days.

Of the five 1-acre plots it was very noticeable that the pasture on the area which was not subsoiled, and off which a crop of oats for hay had been taken, was poor compared with that of the remainder of the field. There was a big percentage of bare ground. Another interesting

feature was the marked contrast in the growth of the rye-grasses, but in particular the strong growth of cow-grass on plot 1, which had received 1 ton of lime and had been subsoiled and a crop of green oats and vetches ploughed in. The resulting humus, in addition to the lime and deep working before grassing, undoubtedly favoured the deep-rooted clover. This good growth was sustained in the second season —that is, till the end of last autumn. At present the pasture is the best on the area. The white clover has given satisfactory results so



SKETCH-PLAN OF PUWERA EXPERIMENTAL AREA.

far. Brown-top is showing up in the pasture, but the absence of paspalum has been very disappointing. The germination test of the paspalum-seed sown in the mixture was only 17 per cent., which is low for Australian seed. In the season just passed only odd plants here and there could be found. With a view to getting paspalum established, locally grown paspalum hay was fed out to steers on the plots on a portion of this field during August last. The germination of an average sample of seed taken from this hay was only 7 per cent.

The field was top-dressed on 29th June last with 3 cwt. per acre of basic slag (analysing 15 per cent. P_2O_5, with a citric solubility of 79 per cent., which is comparatively low). At the time of writing it is evident that the dressing was very effective. Combined with the regular chain-harrowings which the area received, and judicious stocking, it has maintained the pasture in good condition. The drainage is now all that could be desired, and it has been tested severely by two wet winters. Moreover, it will be remembered that before Field 3B was broken in it was very wet and unsafe for animals. The pasture is satisfactory, though it must be borne in mind that the seed-mixture is an experimental one, and after three years' experimenting and observation it has been found that the grass-seed mixture can be improved, as will be pointed out later.

Field 5 (12 acres).

This area was divided into eight plots of 1½ acres each, and sown with various grass-seed mixtures on 5th May, 1920. The take was good, and some very interesting and useful data have been gained from these plots.

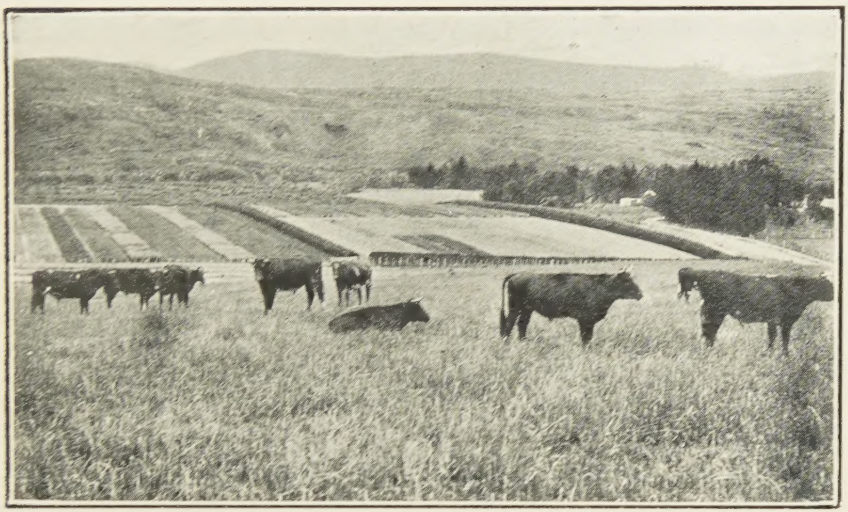
The field was divided into four equal parts and top-dressed on 16th May, 1921. The portion adjoining Field 6 received basic slag of the same grade (15 per cent. P_2O_5) as was applied to Field 3B; the next area received finely ground Nauru phosphate; the third, finely ground Makatea phosphate; and the last (adjoining Field 4), a mixture of ground Makatea phosphate and finely ground limestone containing 40 per cent. of tricalcic phosphate. The rate per acre of these applications was 3 cwt.

The field has been regularly grazed with sheep, cattle, and horses. Careful inspections of the pasture have been made from time to time; and though little which would be considered new in other parts of New Zealand has been observed, still for this type of land in the North Auckland Peninsula the evidence bears local significance. On a carefully prepared seed-bed Poverty Bay rye-grass has taken better than other strains that were tried; Italian rye-grass has given early feed; red and white clover (but particularly the latter) have done well. It is certainly advisable, where paspalum is included and is intended to become the "sheet-anchor" of the pasture, to sow cocksfoot and crested dogstail so as to make a good sward while the paspalum, which is slow in establishing, is getting possession. Where sowings of up to 6 lb. of paspalum were made with 10 lb. to 12 lb. of cocksfoot, 2 lb. of crested dogstail, and a judiciously chosen proportion of rye-grasses, clovers, and Lotus major, the pasture was distinctly better in the second and third years than where either cocksfoot or crested dogstail (but particularly both) were omitted. At the time of writing it is apparent that on this field paspalum, where it was allowed to seed in the autumn, is asserting itself, and bids fair to become the dominant grass. The take of paspalum on the plots where it was included in this field has been good, whereas on Field 3B, as already pointed out, it was most disappointing. If this was the fault of the quality of the seed, then autumn sowing may be relied upon to give a satisfactory take. Spring sowings of paspalum-seed are generally recommended where a special paspalum pasture is the object in view.

Field 6 (10½ acres).

This area was sown in pasture some ten years ago but had run out. Before breaking it up the covering consisted chiefly of Chewings fescue, weeds, and moss, but a little danthonia was present. It was resown with the following mixture in April, 1921: Western Wolths rye-grass, 20 lb.; paspalum, 6 lb.; cow-grass, 3 lb.; white clover, 3 lb.; Lotus major, 1 lb.; yarrow, ½ lb.; chicory, ½ lb.: total, 34 lb. per acre.

The take was good, except on two plots where finely ground rock phosphates were used with finely ground lime.* As would be expected, the Western Wolths rye-grass made a luxuriant growth, and when this went off in the dry, hot weather in December and January the cow-grass came away well. White clover and Lotus major have also grown well. Though the paspalum was slow it has appeared well



VIEW ON FIELD 6, PUWERA EXPERIMENTAL AREA.

The nursery and Field 2 are seen on the lower ground in the middle distance.

distributed over the field, but thicker and stronger on the wet patches. Though yarrow was sown it is not showing to nearly the same extent as chicory, which is well distributed and growing strongly. This deep-rooted plant should help to open up the stiff clay soil. This was the intention in trying it, as well as including it for condimental purposes.

On 17th June last about one-third of the plots numbered 1 to 5, on the side adjoining Field 5, was top-dressed with 3 cwt. per acre of Bilston basic slag; the remainder received Belgian slag at the same rate. (Analyses: Bilston, 16·96 per cent. P_2O_5, 81 per cent. citric

* See *Journal*, December, 1921, pp. 364–65, for details.

soluble; Belgian, 18·10 per cent. P_2O_5, 85 per cent. citric soluble.) The dressings were made across the plots, which run parallel to the main road. The response to the slag is already most marked in the colour and growth of the pasture. This area has been grazed with steers, dairy cows, and sheep. At the time of writing it is pleasing to record the manner in which paspalum is showing up on the field, associated as it is with white clover, Lotus major, and chicory, as already referred to. In the wetter patches, as might be expected, it is looking strong and healthy.

Field 7.

An area of 4½ acres of better-quality soil was sown in this field, which lies below Field 3B. The tall manuka, with some patches of flax, was cut, let lie for two months, and burnt. On the ash the following mixture of seeds was surface-sown, without any added manure: Perennial rye-grass, 48 lb.; Italian rye-grass, 16 lb.; paspalum (Australian seed), 32 lb.; crested dogstail, 8 lb.; red clover, 12 lb.; white clover, 8 lb.; Lotus major, 4 lb. Approximately 28½ lb. of this seed-mixture was sown per acre. The take was patchy, but good where the burn was successful.

Another portion of this field, lying on either side of the main drain and below Field 3A, was cleared of manuka and ploughed in the middle of July last, and is now lying in fallow. Ground lime was applied on 29th August at the rate of 1 ton per acre. It is intended to sow this area with turnips and swedes.

ROOT CROPS.

Turnips and Swedes.—Before Field 3A (4 acres) was broken in it was very wet and boggy. This condition was due to the fact that the soakage from the hilly ground of Fields 4 and 5 found an outlet in that area. As a consequence soft wet patches due to surface springs were distributed over the slopes on the field (3A) and, with the gum-holes, made the drainage bad. The flat land was swampy. After under-draining with manuka fascines, with their outlets into the main open drain (see plan), the field was fallowed, received 10 cwt. per acre of burnt lime, and was sown in November, 1921, as follows: 1 acre (near main road), Purple-top Mammoth turnips; 1 acre (adjoining), Devonshire Greystone turnips; 2 acres (near Field 7), Garton's Superlative swedes. A fertilizer mixture consisting of two parts of basic superphosphate to one of blood-and-bone was used at the rate of 3 cwt. per acre with the turnips, while 4 cwt. of equal parts of the above ingredients were used with the swedes.

Purple-top Mammoth turnips yielded 13 tons, Devonshire Greystone 19½ tons, and Garton's Superlative swedes 24 tons per acre respectively. The soft turnips did not yield as heavily as the crops of the previous season grown on Field 3B. The latter result was due, no doubt, to the more thorough preparation of the soil before sowing, and partly, though to a lesser degree, to the more favourable season. The summer was wet and cool. Soft-rot destroyed a small percentage of the roots.

Swede Variety Trials.—The following table of results from the nursery plots (Field 1) gives some results of interest:—

Variety.	Yield per Acre.		
	Tops.	Bulbs.	Total.
	Tons.	Tons.	Tons.
Crimson King	5·60	9·43	15·03
Garton's Superlative	5·01	14·15	19·16
Garton's Improved Breed of Keepwell	5·60	11·80	17·40
Garton's Improved Model	6·19	11·92	18·11
Webb's Masterpiece	4·42	11·20	15·62
Webb's Empire	5·90	10·90	16·80
Webb's Imperial	5·01	12·08	17·09
Webb's Monarch	3·83	8·25	12·08

Experiments with Mangolds.—These tests were also carried out in the nursery, as here tabulated :—

Variety.	Plot 1.			Plot 2.			Plot 3.		
	Yield per Acre.			Yield per Acre.			Yield per Acre.		
	Tops.	Bulbs.	Total.	Tops.	Bulbs.	Total.	Tops.	Bulbs.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Webb's Smithfield Yellow Globe	3·24	24·74	27·98	2·35	22·38	24·73	2·66	23·49	26·15
Webb's New Lion Yellow Intermediate	3·83	27·84	31·67	2·35	21·21	23·56	3·02	21·91	24·93
Webb's Red Intermediate ..	4·27	29·40	33·67	2·58	23·56	26·14	3·53	23·66	27·19
Webb's Mammoth Long Red ..	6·18	24·74	30·92	3·53	19·14	22·67	5·18	19·12	24·30
Pilkington's Yellow Globe ..	3·39	16·24	19·63	2·43	13·10	15·53	3·83	12·96	16·79
Pilkington's Jersey Queen ..	4·12	28·13	32·25	2·94	24·75	27·69	4·35	26·11	30·46
Pilkington's Golden Tankard	5·89	24·74	30·63	3·83	19·65	23·48	5·89	22·54	28·43

Plot 1 was dressed with agricultural salt at the rate of 4 cwt. per acre ; plot 2 had no salt applied ; plot 3 received salt at the rate of 2 cwt. per acre. A mangold-manure was applied with the seed.

It will be seen that the mangolds which received the dressings of salt gave increased yields over those which received no salt, and the heavier dressing of salt is to be recommended. Considered in averages, the check-plots gave approximately 23½ tons, the addition of 2 cwt. of salt gave 25½ tons, and that of 4 cwt. of salt 29½ tons per acre. Considered as percentages, the check-plot yielded 100 per cent., the 2-cwt.-of-salt plot nearly 109 per cent., and the 4 cwt. of salt 126 per cent. The value of salt to the mangold crop is not new knowledge, but it is surprising how many farmers neglect an important ingredient like this in applying the mangold and other manures.

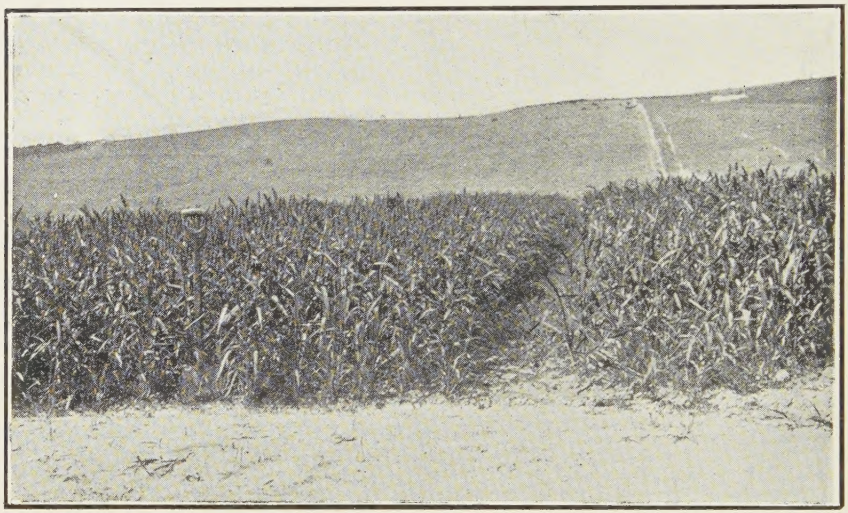
At Albany a good crop of mangolds was grown. Nitrate of soda, applied at the rate of 1½ cwt. per acre in addition to the ordinary mangold-manure put in with the seed, gave no economical gain in weight of crops. The experiment will be repeated again this season.

Carrots, kohlrabi, and Japanese radish all have done well at both areas. Carrots grown with superphosphate in plots side by side with powdered Nauru rock phosphate and with no manure have given some results of interest. Considered as percentages, the check (no manure) was put down as 100 per cent., the Nauru gave 150 per cent., and the

super 159 per cent. Nauru therefore brought about an increase of 50 per cent., while the super was 59 per cent. over and above no manure.

FORAGE CROPS.

Algerian oats, Japanese millet, maize, and sorghum provide useful fodder. For late winter and spring feeding, oats with vetches can be strongly recommended for feeding off with sheep, dairy cows, and other stock. At Puwera 4 acres in Field 2 was sown with 2 bushels of winter tares on 20th and 21st May, 3 cwt. of superphosphate per acre being applied at the time. The crop gave an estimated yield of 2½ tons per acre of oat and vetch hay, which provided, in addition to grass hay, a useful food-balance to the roots fed to the stock on



CROP OF JAPANESE MILLET IN FIELD 2.

the area in the winter and spring. Japanese millet drilled at the rate of 15 lb. to the acre, with 3 cwt. of a super and blood-and-bone mixture, gave a good crop. Hickory King, Dairy Cream, and Ninety-day maize have given the best yields of green stuff. Sorghum saccharatum and Planter's Friend yielded well at Albany, but Sudan grass has not given results in keeping with what is claimed for it.

INTRODUCED GRASSES AND CLOVERS.

Kikuyu-grass (*Pennisetum clandestinum*) is giving more encouraging results each year (see *Journal* for October, 1921). Plots were laid down last spring at Albany and Puwera, combining white clover and Lotus major respectively with the kikuyu-grass. At both places the resultant combination produced a good sole. The legume in each case improved the feeding-value of the pasture. At Albany the plots were fed off with heifers. These plots were top-dressed last autumn with

basic slag at the rate of 3 cwt. per acre. At Puwera half the plots were cut and made into hay, and the remainder left uncut, the object being to test the value of cutting on the resultant pasture. The areas which were cut, similarly to the area at Albany that was grazed, gave better winter and early-spring growth than the uncut areas. In Africa, the native home of kikuyu, the grass is grazed and also cut for hay, with advantage in both cases to the pasture. When the writer was in New South Wales recently he inspected areas of kikuyu laid down for experimental purposes to test the grass as a special dairy pasture. The soil on the areas examined was a poor sandy loam, but the grass had done well and formed a fairly close sward. It exhibited a tendency for the runners to pull out when grazed, but this does not occur on stiffer soils. The cows milked satisfactorily on the pasture. At Puwera an area of 1 acre has been laid down with kikuyu-grass combined with white clover, red clover, and Lotus hispidus ("angustissimus"). This will be grazed and carefully watched with the object of testing the pasture under ordinary farming-conditions.

Kikuyu-grass has withstood winter conditions well at Puwera. Several recorded frosts each winter have not cut it down. Sixty people (mostly farmers) have received supplies of the grass from the Department's areas since November, 1920. Reports from these farmers in North Auckland are favourable. In the south of Auckland it is reported that the frosts in winter have cut it down. Farmers state that it is palatable and relished by stock. Kikuyu, however, stands the cold winters better than most other species in South Africa, especially on the high tableland at such altitudes as Johannesburg and Pretoria.

Crimson clover gave a very good crop last season. White Lodino clover continues to give excellent results.

MISCELLANEOUS CROPS.

Rape, mustard, and vetches have given good results when the ground was well prepared and suitably manured with a mixture of superphosphate and blood-and-bone. White Italian lupins did poorly at Puwera. It is intended to try blue lupin this season, with the object of securing an additional crop which provides humus, particularly for orchards. Buckwheat has not proved sufficiently encouraging to go on with further trials. Kudzu vine, a Japanese legume, and two species of *Melilotus* are being tested at Puwera.

TOBACCO.

Tobacco gave a very satisfactory crop at Albany last season. The leaf grown was an American type suitable for making cigarettes and light tobacco. It was pronounced by an expert from a large tobacco-manufacturing firm to be of very good quality. It was treated in a barn by artificial heat, and when the cure has been completed the leaf will be further examined for burning and other qualities.

LINSEED.

Linseed again produced good results at Albany (see *Journal* for October, 1921, p. 234, for previous year's results). The soil on which it was grown is naturally well drained. It succeeded a crop of vetches,

which were turned under. A bushel and a half of South Island seed was sown per acre, and a blood-and-bone and superphosphate mixture applied at the rate of 5 cwt. per acre. The yield was estimated at 18 bushels. At Puwera the crop was sown on low-lying land, and as the summer proved wet the crop did poorly on account of the drainage being unsatisfactory.

STOCK, WATER, AND SHELTER AT PUWERA.

Cattle and horses have done well on the Puwera Area, but sheep have not thrived. The Live-stock Division gave the opinion, after inspection of the sheep, that internal parasites (mainly stomach-worms) were the cause of the trouble. No sheep have been bred on the area, and the only evidence on which these observations were made referred to store sheep put on for fattening.

A spring on the highest part of Field 5 was tapped, and by laying ¾ in. galvanized pipes Fields 5 and 6 were provided with good drinking-water. Wooden troughs fitted with ball cocks have been put in on both these fields. Similar provision for stock has been made below the nursery and in Field 3. In Field 7 a running stream and a lagoon provide an unfailing supply of good water. Shelter consists partly of tall manuka scrub and of wattles, the latter having been sown some years ago. Further wattle-seed is being sown this season for shade and shelter, and also to add to the appearance of the area. A three-rowed hedge of Japanese tree-lucerne (*Tagasaste*), black-wattle, and brush-wattle (*Albizzia lophantha*) encloses the nursery.

SUMMARY.

The method for treating ploughable land with heavy types of soil such as met with at Puwera and Albany is one of deep cultivation, following drainage (where necessary), liming, and working up the surface to a tilth with a somewhat cloddy surface, rather than that of leaving the soil too fine on top. The tine cultivator in addition to the disk is useful for this purpose. The failure to farm gum land successfully is due largely to faulty methods of cultivation. A selected annual crop ploughed under, or fed off before ploughing, is advisable.

For pasture Puwera experiments indicate that the following seed-mixture should give good results: Perennial rye-grass (Poverty Bay preferred), 8 lb.; Italian rye-grass, 3 lb.; cocksfoot, 10 lb.; crested dogstail, 2 lb.; paspalum (Australian seed), 6 lb.; brown-top, 1 lb.; white clover, 2 lb.; red clover, 3 lb.; chicory, ½ lb.: total, 35½ lb. per acre. This mixture costs, at present prices, about £1 14s. per acre. It may be reduced by eliminating the chicory and reducing slightly the perennial rye-grass and paspalum. Superphosphate, mixed with basic slag or ground mineral phosphate, may be applied with the grass-seed at the rate of 2 cwt. to 3 cwt. per acre. It has been calculated that from £6 to £7 per acre will cover the cost of breaking in the land and laying down the pasture. For top-dressing basic slag has given the best results. Superphosphate and lime, and also superphosphate mixed with ground mineral phosphate, have given very good results. The use of lime is to be recommended. The permanent grass-mixture specified, though based on the results of

several years' experiments and observation, cannot be considered as final. Pasture trials are slow, and need careful observations over a period of years for arriving at more or less conclusive results. To date the sowings on Fields 3B, 5, and some on Field 6 have done well, and promise to improve and hold out.

From the agricultural point of view the investigation aims at gaining a knowledge of how best to treat these lands in order to secure and maintain the best pastures and grow special crops under the conditions. With such knowledge costs can be investigated and reduced by cheapening the processes involved. Considerable success has been gained with the cultivation of fodder and other special crops. Some years of careful observation and further experiments are needed to prove the effectiveness and permanency of the results achieved with pasture.

SHEEP ON FIELD 6, AT PUWERA.

Photo taken when field was in young grass: first season.

THE INSTRUCTIONAL SIDE.

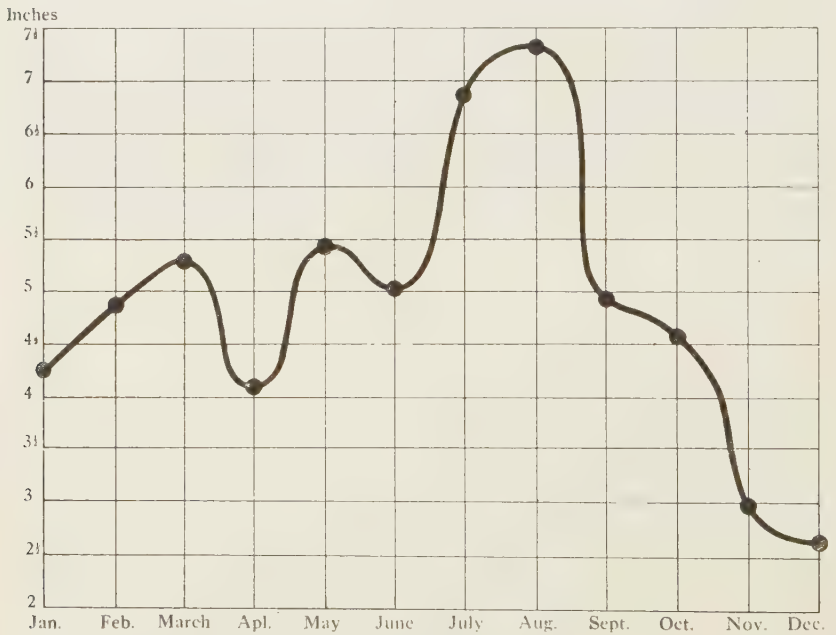
Though primarily the breaking-in of the clay gum lands is the object sought at Albany and Puwera, a good deal of instructional work has been carried out in conjunction with the areas. In March last a body of one hundred farmers, many of whom were accompanied by their wives, were shown over Puwera, and the results observed were freely discussed. The members of the Kauri-gum Commission visited Puwera and investigated the methods employed for the bringing-in of such types of gum lands. Mr. W. Dibble, late Fields Instructor, and the writer were afterwards examined as witnesses by the Commission in Auckland, and our printed reports were handed in for the Commission's use. About forty youths taking the agricultural-science course at the Whangarei High School again visited Puwera in March

last, and were given a field-day on the area. Visitors attending the Albany Show last February availed themselves freely of the opportunity of being conducted over the plots. It is pleasing to record that the results achieved on these areas are being applied in the agricultural practice of local farms. One need only mention the great increase of Japanese millet in the Whangarei district last season. A number of farmers present in March last mentioned the fact that the crops seen on the Puwera Area in the previous season induced them to try it, and, they added, with very satisfactory results.

It is difficult to exactly gauge the practical good achieved by this means, but it is probably greater than is often considered to be the case. Not only has local interest been thoroughly stimulated in the work, but interest in the agricultural possibilities of gum lands has extended to south Auckland and even beyond the province. The exhibit of gum-land produce shown at the Manawatu Winter Show in 1921 aroused considerable interest, and favourable comment was made upon it. Recognition of the work done has been given freely by newspapers in the Dominion.

RAINFALL RECORDS AT WHANGAREI.

The relation between rainfall and the cultivation methods adopted at Puwera will be seen from an examination of the accompanying graph. When it is necessary to fallow an area it is ploughed and subsoiled about February or March, and allowed to remain in the rough condition throughout the winter, when the rainfall is heaviest.



GRAPH SHOWING THE AVERAGE RAINFALL AT WHANGAREI OVER A PERIOD OF TEN YEARS: 1912–21 INCLUSIVE.

Weathering helps to break down the sod in a natural way, and when the rainfall commences to drop, from October to midsummer, cultivation of the surface with disks and tine cultivators saves moisture stored up by the winter and spring rains.

Details of the rainfall at Whangarei during the period January, 1921, to September, 1922, are given in the following table:—

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Rainfall (Inches) and Number of Wet Days, 1921.												
5·88	7·04	2·11	1·87	1·66	5·07	2·77	2·78	2·96	6·70	1·72	5·97	47·13
13	12	11	7	7	11	12	13	7	15	5	11	..
Rainfall (Inches) and Number of Wet Days, 1922.												
5·81	6·70	3·53	3·15	6·67	5·69	6·81	1·58	6·0	4·10	..	..	50·04*
9	14	15	10	17	13	15	10	13	20	..	..	..

* Ten months.

GENERAL.

For information regarding the settlement of gum lands readers interested may refer to the report of the Commission on the Kauri-gum Industry, presented to Parliament in the second session of 1921—pages 18 and 19 in particular. Until the present investigation is more complete definite conclusions must be withheld. It is satisfactory, however, to be able to state that the results obtained at Puwera and Albany so far can be applied to very extensive areas in the Auckland Province, and serve as a means towards transforming them from idle wastes into lands of more profitable use.

Those interested may be also referred to two articles published in the September, 1922, issue of the *New Zealand Journal of Science and Technology*—"Soil-productivity and the Distribution of Population in North Auckland," by H. T. Ferrar; and "Chemical Aspects of some North Auckland Soils," by W. A. Given.

Blackleg.—Amended regulations under the Stock Act for the prevention of blackleg among cattle were published in the *Gazette* of 19th October. Their effect is to reclassify infected "A" areas in the Auckland District as "B" areas. This action has been taken owing to improvement which has taken place in the position regarding the disease.

Scientific Breeding of Animals.—At the last meeting of the Board of Agriculture a letter was received from the Franklin Agricultural and Pastoral Association, enclosing copy of a remit that had been passed by the Council of Agriculture—namely, "That the attention of the Board of Agriculture be drawn to the necessity of conducting an extensive experiment in the scientific breeding of animals, and that they consider and discuss this question with the Department of Agriculture with the idea of starting such an experiment." It was agreed that inquiries be made by the members of the Board individually to ascertain what could be done in this direction, and that the views or opinions of the leading New Zealand breeders and agricultural experts with regard to the breeding of live-stock on the most modern and scientific lines be collated; the results of this inquiry to be brought forward at the next meeting with a view of having a report drafted for circulation among New Zealand farmers.

APPLE FLESH-COLLAPSE OR BROWN-HEART.

SOME RECENT INVESTIGATIONAL WORK.

R. WATERS, Biological Laboratory, Wellington.

THE disease here dealt with attracted little attention until the year 1920, when its prevalence caused considerable loss among New Zealand apples. From that time onward the disease came to be known as flesh-collapse. It is now known, however, to be identical with the condition occurring among apples shipped from Australia and Tasmania, and there termed "brown-heart."

The writer recently visited cool stores in various parts of New Zealand for the purpose of further investigating the cause and the prevention of flesh-collapse. It is satisfactory to be able to state that the results so far point to several measures that can be adopted for the prevention of the disease.

SUSCEPTIBILITY OF APPLES TO FLESH-COLLAPSE.

The view that the quality of the flesh of some varieties, lines, or individual apples as they reach the cool store is such as to render them more liable than others to flesh-collapse has been further substantiated this year (1922).

The opinion was held by some growers that certain hill country produced fruit more liable to flesh-collapse than that grown on the flats. An examination of several lines from the flat country has shown this opinion to be unfounded. These lines, which stored well in previous years, have this year shown up to 25 per cent. of flesh-collapse. The disease is not confined to Nelson. Fruit grown in the Hawke's Bay and Wellington Districts has this year been shown to be affected. The matter of locality would appear to be relatively insignificant concerning the cause of the disease.

The maturity of the apple is, however, an important factor. A prominent grower of Sturmers on Nelson flat country had never known flesh-collapse to affect his fruit until the 1922 season. The first case examined was $2\frac{7}{8}$ in. fruit, and out of one hundred cut open twenty-five were affected. The employee responsible for the picking is widely respected for his experience and practical ability, and undoubtedly the past results obtained by him justify the regard paid to his views. His explanation was that the Sturmers in question matured earlier this year than last. They were picked two weeks earlier than last year, but even then he considered they were a week more advanced than last year. It remains to be seen if these weather conditions have deluded less-experienced growers into picking fruit more mature than is their custom for cool-storage purposes. In no circumstances, however, must it be considered from this that overmaturity is the sole cause of flesh-collapse. My experiments (details of which will appear later in the *Journal*) indicate clearly that this is not so. In these experiments overmature fruit is shown to be much more liable to such injury than greener fruit. Nevertheless, even the least-mature fruit is seen to have suffered up to the extent of 12 per cent. after five months' cool storage.

That better results than this can be obtained without cool storage may be judged from the following: A certain grower stored part of his Sturmers in a galvanized-iron store, with sarking under the roof but no lining or ceiling, and part in a cool store. He did not aim to keep the former fruit longer than August, and had just repacked the last of them on 31st August when visited. One hundred 3 in. to $3\frac{1}{4}$ in. rejected Sturmers were cut open. The fruit was golden yellow with a high colour, but no single instance of flesh-collapse could be found. These apples were picked on 25th May. In the cool store it was found that this grower's $2\frac{3}{4}$ in. Sturmers were affected with flesh-collapse. This may cast a reflection upon cool stores which is not warranted, for it may be added that at present no neglect or carelessness on the part of cool stores has come to my knowledge to which I could attach the occurrence of flesh-collapse; in fact, the disease has occurred where exceptional care has been taken to avoid it. Nevertheless, my conviction is that the disease occurs as the result of conditions in cool stores, and certain cool-storage methods will be later referred to which I believe will reduce it.

Observations of past seasons' apples are still being made, but my opinion is that the results already secured show clearly that in certain cases flesh-collapse may be very greatly decreased by selecting less-mature fruit for cool storage. Naturally enough, a grower strives to store fruit that will be most attractive on the market. Such fruit tends to be of relatively high colour and advanced maturity. Under optimum cool-storage conditions it may be possible to handle satisfactorily such fruit. In the meantime, however, if this effort after colour is overdone, the fruit under present storage conditions may meet with a degree of flesh-collapse similar to that affecting such samples under experiment. Of the numbers of growers who have suffered heavy losses from flesh-collapse in the past three years there is no doubt that many would reduce their losses very considerably by selecting fruit less mature than that which failed to keep.

COOL-STORAGE METHODS SUGGESTED FOR THE PREVENTION OF FLESH-COLLAPSE.

The conclusion reached from last year's observations as to cool-storage conditions inducing flesh-collapse was that the daily period during which the power is applied to keep the temperatures to the accepted standard is a factor. This year's work has disclosed some of the features accompanying the application of the power over a long as against a short period per day. In these results is, in my opinion, to be found a factor, if not *the* factor, in cool storage that finally induces flesh-collapse.

Difficulties at the Time when the Disease is induced.

In 1920 flesh-collapse was first noted about September; in 1921 on 16th September; this year it was first noted towards the end of June, a little less than three months after the fruit was placed in the cool store. There is some reason for thinking that the experience of certain growers as to the advantages to be secured from delayed storage likewise has a bearing on the incipience of flesh-collapse. Their experiments

have indicated that fruit held up to seven weeks after picking has subsequently cool-stored better than that cool-stored immediately after picking. This improvement may be due to the fact that cool-storage conditions in the first two months are not as favourable to the fruit as are the conditions under which the fruit was held outside. Coinciding with the dates mentioned is the well-known fact that the most difficult time to secure control of the cool-storage conditions is in the first few weeks. The occurrence of flesh-collapse this year in June certainly shows that some at least of the damage was effected not long after the fruit came in. Moreover, the holding of fruit, as in the experiments referred to, for up to seven weeks may be long enough to miss the most difficult weeks of cool storage. It may be safely said that if one could obtain conditions in cool store as good as those outside then one would expect to obtain equally good results.

These considerations lead to a comparison of the outside with the cool-storage conditions. Natural conditions of temperature and humidity admit of Sturmers being satisfactorily held in suitable sheds until August or September—that is, for three or four months after picking. Thereafter the fruit becomes more and more liable to shrivel or wither. Obviously this is due to excessive loss of moisture; nor is this astonishing when it is known that the average relative humidity from May to September in the district now referred to—Nelson—is 82, while cool stores are more often in the vicinity of saturation-point—*i.e.*, a relative humidity of 100.

In successfully storing the fruit until August or September the cool-storage process has done no more than certain growers have accomplished in a simply constructed shed. Cool storage to be of practical value must by this time have arrested the activities of the fruit more than could have been done in a shed. In cool storage, therefore, the first essential is a lower atmospheric temperature-range, for the lower the temperature-range in the apple-flesh the slower are the metabolic or life processes carried on in the fruit, and the slower does it approach maturity. This statement holds good to a certain degree of coldness only; below this the health of the fruit is liable to suffer.

As indicating the temperature-ranges under which fruit may be successfully held in sheds for three or four months in Nelson, the temperature statistics for this district from May to September, 1920, are here quoted, the figures representing degrees Fahrenheit:—

1920—Month.	Mean Maximum.	Mean Minimum.	Mean for the Month.	Mean Daily Range.	Extreme Maximum.	Day of Month.	Extreme Minimum.	Day of Month.	Extreme Range.
May ..	56·5	40·6	48·5	15·9	66·0	3rd	29·0	21st	37·0
June ..	54·6	40·5	47·5	14·1	58·0	12th, 13th, 18th	35·0	13th, 14th, 26th	23·0
July	53·2	38·8	46·0	14·4	61·0	4th	30·0	25th	31·0
August	53·9	39·2	46·5	14·7	59·0	4th, 25th, 30th	31·0	15th, 16th, 22nd	28·0
September	57·3	43·7	50·5	13·6	63·0	25th	34·0	15th	29·0
Average	55·1	40·5	47·8	14·5	61·4	..	31·8	..	29·6

These figures sharply conflict with many of the views held on the subject of cool-storage temperature. The facts of the case are that apples stored in sheds are occasionally subjected to lower extremes of atmosphere-temperature than any cool-storer in New Zealand would like to record in his log-book. If a temperature of 29° damaged the fruit in May, how, then, did such fruit satisfactorily store in the shed till the following August? Lower temperatures than these will be met with in places farther from the sea. Taking the average of the extreme minimum temperatures in the table, one gets 31·8°. For the minimum discharge temperature in a cool store running twelve hours continuously 32° therefore appears very much on the safe side. Turning next to the extreme maximum temperatures, it is interesting to note that on 12th and 13th June such maximum reached 58°, and on 13th and 14th of the same month the extreme minimum reached 35°. Here is an extreme range of 23° during three consecutive days. Again, the mean maximum averaging 51·1°, the mean minimum averaging 40·5°, and the mean temperature for the month averaging 48·7°, give some idea of the far higher temperatures experienced by shed-stored fruit as compared with that placed in cool stores.

These higher temperatures are undoubtedly responsible for the earlier ripening of the apples outside. The extreme ranges of temperature recorded in the table, averaging 29·6°, and the mean daily ranges, averaging 14·5°, show how tolerant is the apple of fluctuating atmosphere-temperatures. It will be later suggested that fluctuating atmospheric temperatures may be of great service in cool stores. It would be quite wrong, however, to assume that these atmospheric temperatures in the shade were actually transmitted in full to the flesh of the apple; this is by no means the case. Apple-flesh heats and cools slower than its surrounding atmosphere; in fact, it averages out the surrounding temperature. Thus the mean temperature for the month, averaging 47·8°, will closely correspond with the mean apple-flesh temperature of shed-stored apples about Nelson. The mean apple-flesh temperature in cool stores must therefore be considerably below 47·8° in order to secure successful storage for seven or more months.

Summarizing, it may be said that cool stores must secure a mean apple-flesh temperature much below 47·8° F. in order to arrest the ripening of the fruit, and a relative humidity above 82° to prevent shrivelling; and that a minimum atmosphere-discharge of 32°, running for twelve hours, is well on the safe side.

Some of the difficulties that arise in the effort to secure these results may now be considered. At the commencement of the storage season the store is warm, and some thousands of cases of fruit are brought in with an apple-flesh temperature of approximately 57° (which is about the mean atmospheric temperature for the month of April in Nelson). The following work has then to be done: (1.) An immense amount of heat must be removed from the fruit, the cases, and the store, such heat being carried by the circulating air to the refrigerating agent which conducts it out of the store. (2.) A large amount of moisture must be removed as it is given off from the fruit, such moisture (in a dry system) being carried by the circulating air to the battery-pipes, where it is arrested by freezing. Later on it is melted from the pipes and run away in a drain. (3.) The placing of such a mass of closely stacked fruit into a closed compartment makes

it necessary to provide for yet another factor—that of the disposal of the gaseous and vaporous by-products of metabolism, such as carbon dioxide and esters. These are expelled by drawing in fresh air through a special aperture and blowing out the old impure air by way of the doors.

The position of an engineer running a cool-storage plant may be as follows: The speed of his fans is fixed, therefore the rate of circulation is constant. The minimum atmospheric temperature at the discharge is likewise fixed—if by nothing else than by the opinion of the clients; such temperature must not fall below, say, 32°. The supply of ammonia to the battery-pipes is capable of some regulation, but as soon as the ammonia-supply has brought the discharge temperature to 32°, that is the limit of his power. Suppose, however, that the engineer has difficulty in securing 32° at the discharge in the beginning of the season, or that having secured 32° he finds he is not bringing down the temperature of the mass as quickly as he would like, and that his atmospheric-discharge thermometer rises unduly when working ceases: there is still one other course open to him, and that is to work longer hours. If, however, he is already working long hours per day, then a number of complications may set in: (1.) He may find it difficult to reduce the temperature of the mass as quickly as he would wish. (2.) In these circumstances it may be difficult, without materially raising the temperature of the chamber, to defrost the battery, the efficiency of which is consequently impaired both as a cooling-surface and as a collector of water. Under such conditions the store may easily have a relative humidity of 100 (saturation-point), and any further drop in temperature will then be attended by a precipitation of moisture, and later, perhaps, mould-development on the cases. (3.) Ventilation may be deferred for fear of raising the temperature, hence there is an accumulation of gases and vapours from the fruit. In short, the chamber-atmosphere may be damp and impure. Such an atmosphere is not what an engineer would desire; it is unsuitable for the respiration of the living fruit, which finds it difficult to get rid of any surplus water and hard to get enough oxygen.

Where this trouble is experienced there is but one remedy—namely, to increase the efficiency of the plant per hour. Consider what would be the result of increasing the rate of circulation: the more rapidly flowing air would not be in contact with the battery so long; hence in each rotation it would be cooled less, and, being warmer, it would not so quickly cool the cases of fruit over which it was flowing. This would cause the atmospheric-discharge thermometer to rise above 32°, and this rise would then admit of a lower temperature being applied at the battery-pipes to bring down the atmospheric-discharge temperature. The atmospheric-discharge temperature will now have been restored to 32°, but the rate of circulation will be greater. This means that the cooling effect per hour will be greater. Again, the more rapidly flowing air will pick up more moisture, which, when brought to the battery, which is now lower in temperature, will be more readily arrested by freezing. This greater efficiency per hour in the cooling and drying effect of the plant will reduce the necessary hours of running, and thus leave a sufficient period of rest during which defrosting and ventilation could be safely performed.

Such a powerful circulation as this would in all probability be excessive at a later period in the cool-storage season. The suggestion, however, is put forward that the reduction in the hours of running, through increasing the efficiency of the plant per hour by employing an increased rate of circulation, would enable the humidity and ventilation to be better controlled at the beginning of the season, when flesh-collapse appears to be instituted.

Conditions resulting from Short as against Long Working-hours of the Plant.

Turning now from the early part of the cool-storage season to the time later on when even conditions have been established, there would appear to be one other likely factor contributing towards flesh-collapse in stores working long hours as compared with those working shorter hours per day. The maintenance of even temperatures is one of the objects aimed at by cool stores. It is regarded as good practice or as good policy. In some cases, however, it would appear questionable whether the outlay to secure this end was justified. In fact, the maintenance of very even temperatures under some conditions would seem to have led to increased humidity and a decrease in the efficiency of the ventilating process.

A store working eight hours continuously per day will experience a greater fluctuation of temperature than one working twelve hours continuously; while a store working twelve hours intermittently (four hours on and four hours off) will maintain a more even temperature than when working twelve hours continuously. Full-time working—twenty-four hours per day—will produce the maximum of uniformity. The longer the hours of working or the more intermittent the shifts the less cooling effect will be required per hour to keep a given chamber to a given temperature-range. Consequently, with a fixed circulation and dry battery, the longer the working-hours the warmer will be the working-temperature of the battery-pipes and the less their power of arresting water, and therefore the more humid the chamber-atmosphere. In considering the question of ventilation regard must be paid to the temperature at three separate positions—in the flesh of the apples, in the atmosphere within the cases, and in the atmosphere of the chamber outside of the cases. The longer the working-hours the nearer will these three temperatures be to one another, and the slower will be the diffusion between the atmosphere of the case and that of the chamber. It is therefore suggested that in some instances the reduction in the number of working-hours per day, entailing the application of more power per hour at the battery-pipes, would lower the relative humidity below saturation-point (a condition commonly met with), and that the more rapid reduction of temperature together with the longer hours of rest would result in greater differences between the temperature of the case-atmosphere and the chamber-atmosphere—hence a quicker passage of the gaseous and vaporous apple by-products out into the chamber-atmosphere, where they may be dispersed and later disposed of by ventilation.

CONCLUSION.

In conclusion, it may be said that careful observations have been made in stores where flesh-collapse has been slight, and comparisons

have been made with those stores that have suffered in various parts of New Zealand. The relative humidity has been studied, and the temperature-fluctuations at various times of the day have been recorded both in the apple-flesh and in the atmosphere of the chambers at various parts.

Steps are being taken for special experimentation in the 1923 season as regards the factors of maturity of apples, control of storage conditions at the commencement of the season, and fluctuating temperatures.

THE OLEARIA BUD-GALL MIDGE.

DAVID MILLER, Entomologist, Wellington.

MOST people who have grown the akiraho or "akeake" (*Olearia Forsteri* Hook.) will be familiar with the malformed growths or galls which distort the natural symmetry of the shrub (Fig. 1). The akiraho is one of the native shrubs which has become of value to man for ornamental and shelter purposes. In its natural distribution, according to Cheeseman, it ranges from sea-level to an elevation of 1,500 ft., from the East Cape in the North Island to Oamaru and Greymouth in the South Island. It is now very commonly grown in gardens in most parts of the Dominion.

The galls are caused by the larvæ of a small native midge (*Cecidomyia olearíae* Mask.).* The adult (Fig. 2) is a delicate two-winged insect, the female measuring about $\frac{1}{8}$ in. and the male $\frac{1}{10}$ in. in length. The insect is conspicuous owing to its blackish thorax and deep-blood-red abdomen, the apex of which is pointed in the female but knob-like in the male.

In early spring there is a large flight of the midges, which frequent the foliage of their host plant. Their numbers become fewer toward the end of November, when only a few, the last of the brood to emerge, are to be found. The females deposit their conspicuous clusters of bright-red eggs upon the buds of the developing shoots (Fig. 3); and the young larvæ, on hatching, set up an irritation in the rapidly developing and plastic tissues of the bud, so that the young stems and leaves remain aborted and form the galls. The larva is legless, and yellowish in colour, becoming darker as maturity is reached. It feeds on the juices of the plant, the tissues of the gall being particularly succulent. Transformation to the pupa takes place in the gall. The anterior end and appendages of the mature pupa (Fig. 4) are black and the abdomen blood-red, though when the pupa has first formed it is yellowish, like the larva, the darker colours becoming apparent toward the time when the adult is due to emerge. There is apparently only one brood each year, fully grown larvæ and pupæ occupying the galls in early spring, while a few weeks later only pupæ will be found.

An examination of the external form of a gall shows that it is made up of numerous rosettes of more or less aborted leaves, each

* There is some doubt as to the generic location of this species, a matter which is being gone into.

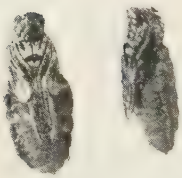
set surrounding a central aperture, which may be conspicuously open or practically closed (Fig. 5). A vertical section across a gall (Fig. 6) reveals numerous chambers into which lead the openings already noted on the surface, and that each chamber contains a larva or a pupa, according to the time of year. A single chamber (Fig. 7) is more or less urn-shaped, and enclosed by thick fleshy walls which abut on those of neighbouring chambers. The opening to the surface is surrounded by whorls of aborted leaves, and more or less completely closed over by a dense mat of downy hair arising from the leaves at the rim.

FIG. 1. SHOOT OF OLEARIA FORSTERI, SHOWING GALLS AND DISTORTION OF STEM.
Gall at apex of stem and that to right just forming. Natural size.

[*Photo by D. Miller.*

A gall therefore is a compound structure, composed of numerous chambers each with its own opening and occupant, the whole forming a succulent malformed mass of tissue attached to the stem, which here becomes broadened and flattened and geniculated to a greater or lesser degree (Fig. 1). At times small single-chambered galls occur wherever an isolated larva has been at work. The larvæ emerging from the egg-masses during the spring attack the actively growing tissues of the buds, stunting the shoots and leaves, which become compacted and form the compound gall. In a similar manner

2



a *b*

4

3

FIG. 2. ADULT FEMALE MIDGE. × 8. FIG. 3. EGG-MASS OF MIDGE ON BUD. × 15.
FIG. 4. PUPA. × 7.
(*a*) Ventral view; (*b*) side view.
[*Photos by D. Miller.*

adjacent growing-points which are infested approach each other and, coalescing, form larger colonies. After a time, when fewer and until no eggs are laid—*i.e.*, from December onwards—vegetative buds, which arise from the axils of normal foliage leaves, and even from the galls themselves, escape infestation and develop as normal shoots and foliage.

The attack of the gall-midge on the akiraho is no new diversion, for the insect and its host had been associated for long ages before the plant attracted the attention of the horticulturist. Moreover, since the akiraho, heavily infested as it is and has been in its natural

FIG. 5. FULLY FORMED GALL.

The club-shaped growth on right is a young shoot upon which a gall is forming. × 2.

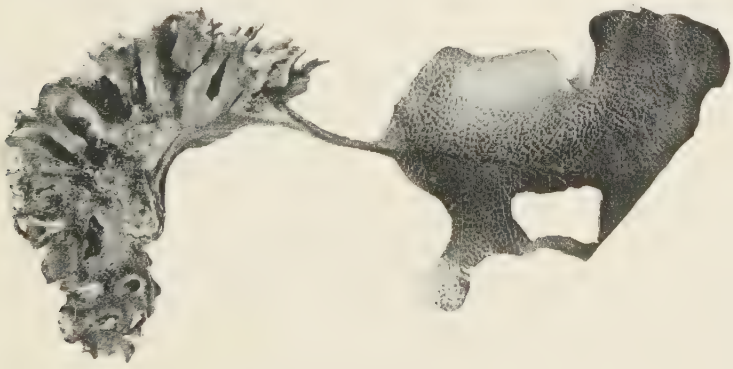


FIG. 6. SECTION OF GALL, SHOWING CHAMBERS, IN ONE OF WHICH IS A PUPA. × 2.

[*Photos by D. Miller.*

environment, has succeeded in maintaining its place as a successful member in the flora of New Zealand, one must look upon the midge infestation as a normal condition. Under cultivation, however, the conditions are somewhat altered, since any malforming factor is obviously detrimental, hindering, as it does, the development of the plant to the ideal standard of man, who at the same time, by crowding the shrubs together, establishes an environment more favourable to the well-being of the insect than would be found under natural conditions.

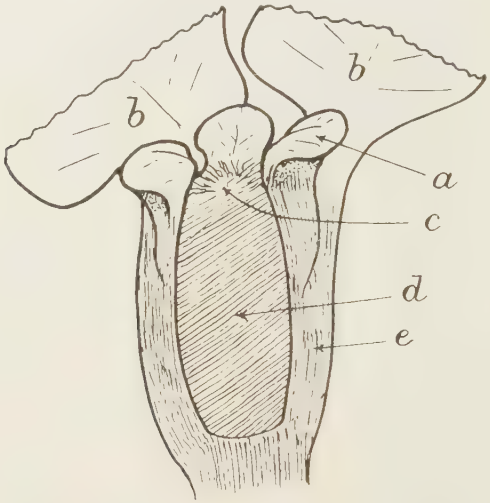


FIG. 7. LONGITUDINAL SECTION OF A SINGLE CHAMBER OF A GALL (SEMI-DIAGRAMMATIC).

(*a*) Inner whorl of aborted leaves surrounding the mouth of chamber (*c*), which is closed by downy hair; (*b*) outer whorl of aborted leaves; (*d*) chamber in which the insect lies; (*e*) thickened wall of chamber. Enlarged. Original.

Although the midge is controlled by natural factors, the influence of the latter is not sufficient for horticultural purposes, it being necessary to reduce the midge infestations considerably below their normal prevalence. Control is a difficult matter. Of course, one obvious method—and certainly the best—of solving the problem is to cease utilizing *Olearia Forsteri* as an ornamental shrub, and to grow other species of the genus not infested by the midge.* The infestations might be reduced to a certain extent by spraying the shrubs throughout the spring with Black Leaf 40 (1 in 800), but applications would have to be made at least two or three times a week in order to be effective.

* *Olearia furfuracea* is also subject to infestation.

Wool Committee.—Dr. C. J. Reakes (Director-General of Agriculture) has been appointed Government representative on the New Zealand Wool Committee, in place of Mr. T. R. Lees, who has resigned owing to absence from New Zealand.

VINE-CULTURE UNDER GLASS.

(Continued from June Issue.)

W. H. TAYLOR, Horticulturist, Wellington.

THE SECOND SEASON.

THE establishment of the vines, treatment during the first season, and the first winter pruning have been dealt with earlier in this series. In the following season strong vines may be allowed to carry a little fruit, but the main purpose will be the extension of the rods. General treatment—stopping growths, &c.—should be the same as for the previous season, except that where laterals are carrying fruit a different system of stopping is necessary, which will be dealt with later on. With regard to the length of rod to be left at the second pruning, opinions and practice among good cultivators vary greatly. In earlier days it was an unvaried custom to work the rods up slowly, heavy cutting-back each season being the rule. For a good many years, however, many first-class cultivators have abandoned the old plan, maintaining that where vines make good rods they are quite able to carry some fruit, and that nothing is gained by cutting them back, and, further, that any harm done is caused by overcropping the young rod rather than by not cutting it back. If really good growth is made, resulting in stout rods, a length of 10 ft. or 12 ft. may be left at pruning-time, but such a length of new rod should rarely be allowed to carry, during the next season, more than one bunch to each other spur. Weaker rods should be cut back farther, as previously mentioned.

VINES IN BEARING.

Climatic conditions vary so greatly in different parts of New Zealand that treatment which would be correct in one part is quite wrong in another. The climate of Auckland, some parts of Hawke's Bay, and a few other localities is essentially different from that prevailing in the South Island and most parts of the middle district. It is evident that, in places where in summer the climate is almost tropical, more ventilation is necessary than is the case in cooler districts. It is a fact that the grape-vine will thrive in places having a much higher average temperature than is recommended for its culture in standard books on the subject. There is, however, a limit, and when the temperature under sun-heat rises above 90° F. any further rise must be checked by whatever means are available. In most places where grapes are grown a much lower mean temperature prevails than is the case in the few warmer places mentioned.

In general practice I am opposed to making any use of the bottom ventilators before the berries begin to colour. The effect of admitting bottom air while the foliage is wet has already been explained. In that case, however, young vines were being dealt with, a very different matter to that of established vines carrying a crop of fruit. Vines in full foliage, and carrying fruit, always hold more or less moisture on their surfaces. This is the case even where damping-down is of

a minimum character, and there is danger in admitting bottom air if the outside air is appreciably colder than that inside the house. In warm districts and during calm weather this condition would not be present, therefore no harm would result from the use of the bottom ventilators provided obvious moisture had been first dispersed.

It is rare to find in this country vineries that are absolutely airtight. In most cases there is some space between the bottom pane of glass in each run and the sill; and this is a good feature, worth securing in all but the coldest districts. Air entering through these spaces passes up between the leaves and the glass. It has very little effect on the temperature in the house, but vastly improves the texture of the leaves, making them firm and leathery, a very desirable condition.

Bearing Laterals.

The universal practice is to leave only one lateral to each spur. No book or article on the subject has come under my notice where any greater number is even mentioned; one lateral to each spur is taken as a matter of course. Commercial growers usually train the rods closer together than is the custom with private growers, and so secure a larger number of smaller bunches. The system in other respects is the same in both cases. The one-lateral system is the only one by which the surface of the leaves can be properly exposed to the sun, which is rightly thought to be a necessity in successful culture, and must be considered so in most situations. Besides this, the attention required in stopping, tying down, &c., is more handily given, and the suppression of pests is made as easy as possible.

Circumstances do sometimes occur where a departure from the one-lateral rule may be advisable. Cases are known where two, three, and four laterals have been left, each of which carries one or two bunches, which are well ripened. These cases are in the north, where the climate is such as to allow liberties not possible in most places; the houses are very large, so that there is a good body of air; and the borders are extensive, of the best of soil, and well fed. The rods are mostly far apart, and it is mainly for this reason that the departure from the usual rule has been made. Though so far successful, this system cannot be recommended for general use. In most parts it would result in failure, while the same results could be secured by the safer plan of an increased number of rods and one lateral to each spur, which method will be followed in this series. None but experienced growers should depart from it.

Routine Work.

Pruning should be done when all the principal leaves have fallen or would fall if the rods were shaken. This will be in the early part of June in most places, but earlier in warm districts. Pruning should not be delayed when this stage is reached; the vines are benefited by a good rest, and, moreover, late pruning causes bleeding, with consequent weakening of the vines. Each lateral should be cut back to the lowest prominent eye, cutting squarely across about $\frac{1}{2}$ in. above the bud. It is bad practice to cut close to the eyes. If this is done, and the vines break strongly, the laterals have not sufficient foothold, and are liable to grow off, resulting perhaps in a barren spur.

After pruning, any loose bark should be stripped off, but no bark should be removed that is not loose. The practice of stripping off all the bark that can be removed is barbarous; it weakens the vine and prevents the rods thickening as they should. Washing or dressing the rods may be necessary, but this will be dealt with in a later section on diseases and insect pests. If the rods are clean no dressing is required.

Vines have a tendency to break the top eyes before those on the lower part of the rods, and if this occurs the top laterals get ahead of the others and tend to weaken those at the base of the rod. To cause an even break, the rods after being pruned and dressed should be loosely tied horizontally along the house under the base of the rafters. In cases where posts for the support of the roof prevent this being done the upper half of each rod should be left loose, so that it may bend down in the form of a bow.

FIG. 1. BEARING LATERAL OF VINE.

The cross-bars show (1) where to stop a sublateral if it is to be retained; (2) where to stop sublaterals if to be suppressed entirely; (3) state of growth in lateral when stopping should be done; (4) tendril to be removed.

During the dormant period all the ventilators should be opened on fine days, and some top air left on at all times; this ensures to the vines a thorough rest. Here is one of the advantages of the vines having the house to themselves, for when the house is occupied by other plants ventilation is adjusted to their needs and a higher mean temperature maintained, which may cause the vines to start too early. It is not desirable to start the vines until a steady rise in outside temperature can be counted on. If they are started too early a spell of cold weather may cause a check in growth, which is a thing to be avoided.

When the time arrives for the vines to start growth the bottom ventilators should be kept closed. Syringing the rods, by creating a moist atmosphere, is considered to assist the vines in breaking. When

all the eyes have broken and made a few inches of growth the rods should be tied in their proper places. This operation requires care, or laterals may be broken off, this risk being greater if they have made much growth. The laterals rarely break quite evenly; some are sure to be more advanced than others. A good time to get the rods into their proper positions is when they average from 4 in. to 6 in. in length.

As stated earlier, each lateral is pruned back to the lowest prominent eye. In all but rare instances there will be other eyes below those pruned to, which, though less prominent, will in some cases break quite as strongly as the selected eye. The two strongest eyes at each spur should be kept until they have advanced far enough to enable the selection of the one to be kept. This will be decided by position; if the two at one spur are equally well placed for tying in, and are otherwise equal, the one nearest the rod should be retained. All but these two should be rubbed off as soon as the rods are tied in their places, or as soon as they show after that time. When the final selection has been made the spare laterals should be cut off about 1 in. from their base.

The growth of the laterals is at this time very rapid, and as it is highly important to prevent waste of growth constant attention is necessary. Each lateral should be stopped so as to secure two leaves beyond the bunch of grapes nearest to the old rod. It may be that the second is the better bunch, and is retained instead of the first. In such cases the lateral should still be stopped at the point indicated, which will be one leaf beyond the second bunch. In the case of close planting it may be necessary to stop at one leaf beyond the first bunch, so as to leave room for the extension of the lateral from its next break. In this case, if the second bunch is retained, stopping must be close to the bunch. This can safely be done to a limited extent, and, in fact, often is. There is no need for haste in selecting the bunches to retain; they take nothing out of the vine until the berries begin to swell. It is best to wait till the berries are set, as it sometimes happens that some bunches do not set well. Surplus bunches should, however, be removed before much swelling of berries takes place.

Stopping the laterals should be done by pinching off the tips with the thumb-nail at a time when the last leaf is about the size of a shilling. In practice, some laterals are sure to get beyond this stage, but no harm is done if they have not extended much. It is harmful, however, to allow them to extend so that several joints have to be removed. The removal of a considerable amount of leafage, as would result from this practice, causes a severe check to the roots, and, what is far more important, the lateral growth will have delayed the progress of the bunches.

Tying down the laterals is at times an operation requiring great care. If the laterals are stout they are extremely brittle, and are easily broken out of the spur. Where the trellis is a good distance from the roof tying-down may be left till the base of the laterals becomes firm, as evidenced by a yellow appearance. The leaves must be kept clear of the glass, which may make it necessary to tie down a little at a time.

Sublaterals.

The treatment of sublaterals is a subject on which there is a wide divergence of opinion among good growers. In former times their extension was believed to be a necessity in promoting root-action. At the present time it is—and, indeed, has been for a number of years past—the practice of some growers to suppress them altogether, pinching them off as soon as they show. The fact appears to be that if the vines grow strongly and make large leaves the sublaterals can be dispensed with. The advantage in doing so is a considerable saving in time, and in cases of close training it allows of a free passage of air among the leaves. It would be inadvisable to suppress sublaterals on vines that do not make large leaves, as in such cases additional leaf-growth would be an advantage. Where retained they should be stopped above the first leaf while this leaf is quite small, and future breaks should be treated in the same way. The breaks from the points of bearing laterals should be stopped beyond the first leaf at each break. Sublateral growth should never be allowed to crowd the space between the roof-glass and the vines, nor to interfere with the main leaves. An even spread of large leathery leaves is infinitely more valuable than any number of small and crowded leaves. One should be able to obtain an uninterrupted view between the foliage and roof throughout the whole length of a fairly large house. If this condition is secured there will be no leaves burned through pressing on the glass, and no accumulation of moisture to cause burning and mildew, while the leaves, being exposed to light and suffering no injury, will be able to properly perform their functions.

Setting and Thinning of the Berries.

In this country there does not appear to be the difficulty in getting a good set that is experienced in the Home-country. No trouble of this kind has come under my notice except in cases where the vines had been badly treated—in some cases the vine-roots driven into the subsoil by growing crops above them, in others a wet atmosphere and consequent mildew. Varieties such as Lady Downs and Muscat of Alexandria, reputed to be shy setters, have in my experience set quite freely. During the flowering-period the house should be kept rather dry—not entirely so, but damping-down should be moderate. Somewhere about midday the vines should be given a slight shake, just sufficient to cause a movement throughout the whole vine; this will cause the dispersion of the pollen. The shaking should be repeated daily while the vines are flowering.

As soon as the berries are set they swell very rapidly. Surplus bunches should therefore be removed before the berries have swollen much, and should not be left for removal as thinning proceeds, as this would cause a waste of energy. Varieties that are known to set freely may be thinned as soon as the blossoms fall, but shy setters should be left till the berries are the size of peas. The earlier thinning is done the easier it will be, and the better. If the berries crush each other before thinning is done the work is slow and difficult, and the berries will not afterwards attain full size.

There are different methods of thinning. The usual is to first remove unfertilized berries, and then ease the upper and crowded

part of the bunch, removing the berries in the centre, and severely thinning those on the under-part of shoulders. A start is then made at the bottom of the bunch, after selecting one berry to form the point. No exact rule can be laid down as to the number of berries to remove, this depending a good deal on the variety. Berries that have short footstalks require heavier thinning than those with long. John Wright, in the *Fruitgrowers' Guide*, states the average number to remove as two-thirds on the lower parts of the bunch, half at the middle, and one-third at the top. This, however, must not be accepted as an arbitrary rule, and experience is the only true guide.

Thinning is usually done with scissors made for the purpose, a thin slip of wood or a forked stick being used to hold the sprays in convenient positions. Where there are distinct shoulders to the

FIG. 2. YOUNG BUNCH OF GRAPES, WITH ONE SIDE THINNED.

bunches these should be raised somewhat by strands of raffia fastened to the trellis. This should be done before thinning the bunch; it enables the leaving of berries that would otherwise have to be removed, because they would be smothered by the shoulder. It will surprise many to know that thinning can be done with the thumb-nail and a finger; a good many growers thin in this way. I have tried it myself, and find it a good method, quicker than with scissors and not so tiring. Thinning must be done while the berries are quite small; it cannot be done if the berries are crowding together. It is usual to warn workers not to handle the berries at all, but I have seen no harm result from this cause, though probably very rough hands would do damage. The scissors cannot be entirely dispensed with, particularly with some varieties that form a lot of unfertilized berries; these must be cut out, or in some cases they would cause late attacks of mildew. This occurs with Lady Downs, a very late variety.

The Stoning-period.

The young berries swell very rapidly for several weeks, and then for three or four weeks almost stand still. The berries at this time look very hard, and the cuticle has a tough appearance. This is the stoning-period. During this time the day temperature should be kept down as much as possible by free top ventilation. The object sought should be to secure as little difference as possible between day and night temperature. No attempt should be made to force the berries to swell, either by feeding the border or syringing the vines. This is the period when attacks of mildew are most likely to occur through wrong treatment, and also is the time when this disease can do most damage. Opening of the bottom ventilators while there is any condensed moisture on berries or leaves must be carefully avoided. The berries swell rapidly again as soon as stoning is complete, this being known as the second swelling. When this begins syringing may be taken up again, and the border may be given liquid manure or water according to its requirements.

(To be continued.)

WEEDS AND THEIR IDENTIFICATION.

(Continued.)

JAPANESE WINEBERRY (*RUBUS PHOENICOLASIUS* MAXIM.).

ESMOND ATKINSON, Biological Laboratory, Wellington.

SINCE the inclusion, last June, of Japanese wineberry (*Rubus phoenicolasius* Maxim.) in the Third Schedule of the Noxious Weeds Act several requests have been received for an illustrated description of the plant. It is in response to these requests that the following short account and the accompanying drawing have been prepared:—

DESCRIPTION.

Many different plants of the genus *Rubus* are well known in New Zealand, the most important being the indigenous bush-lawyers, the various forms of blackberry, and the cultivated loganberries and raspberries.

Japanese wineberry, though distinct enough from any of these plants, is most like the raspberry, which it resembles in its flowers and fruit, and in its more or less upright, bristly-hairy canes, which, unlike those of the blackberry, do not arch over and root at their tips. The canes are reddish in colour, and are rather thickly covered with reddish-purple hairs interspersed with a few, scattered, nearly straight prickles. The leaves are compound, with three leaflets which are roughly egg-shaped or heart-shaped in outline, with the broad end next the stalk, the narrow end being more or less sharply pointed. The central leaflet of the group is much the largest and is borne on a stalk about half the length of the blade, while the side leaflets are practically stalkless. All three are variously toothed and lobed, but generally not deeply so. One of the most striking things

JAPANESE WINEBERRY.

(*a*.) Flowering-shoot, half natural size; (*b*) portion of stem, natural size; (*c*) flower-bud, natural size; (*d*) flower seen from above, natural size. Original.

about the plant is the strong colour contrast shown by the leaves, which are bright green above, while the under-surface, owing to its being completely covered with a thin felt of hairs, is quite white, the red-purple midrib and veins standing out sharply against this background.

The flowers of Japanese wineberry are carried in bunches at the ends of the branches. The petals are very small, and are much less showy than the large lobes of the calyx (the outermost ring of floral leaves), which spread in the form of a star. The flower-stalks and the branches just below them are clothed, like the stems, with red-purple hairs, which are here so abundant as to form a kind of fur. The specific names of plants are generally inappropriate enough, but the name *phoenicolasius* (*i.e.*, "purple wool") is very apt, describing what is certainly the most characteristic feature of the whole plant. It should be mentioned that the hairs are of the type known as glandular, each being tipped with a minute knob like a pin's head, which secretes a sticky substance.

The fruit of Japanese wineberry is of a bright clear red colour, rather like a small raspberry in size and shape, and, like it, pulling right away and leaving a hollow in the fruit when picked, while in flavour it is not unlike a mulberry.

HISTORY OF THE PLANT IN NEW ZEALAND, AND POSITION AS A WEED.

As its name implies, the subject of this article is a native of Japan, whence it was introduced into cultivation many years ago. It was much advertised under the name of "Japanese wonderberry" as being superior to all other types of raspberry for domestic use. The glowing accounts of its ease of cultivation and great yields induced a number of people in New Zealand to give it a trial, and many gardens are still to be found where the plant is in cultivation, though in spite of the pleasant flavour and abundance of the fruit it has never become really popular. The only locality where Japanese wineberry has spread to any appreciable extent is in the Cook and Waikohu Counties of Poverty Bay, where it has become established in isolated areas.

The fact alluded to—that the branches of Japanese wineberry do not, like those of blackberry, arch back to the ground and root at their tips—is an important one in considering the question of its control. It means that, unlike blackberry, the plant cannot grow again from pieces left in the soil, the difficulty of eradicating it being therefore comparatively slight. It should at least be possible, with but little expenditure of time and labour, to prevent the plant's invasion of fresh areas from those where it has become thoroughly established.

Board of Agriculture.—Mr. G. L. Marshall, of Marton, has been appointed a member of the Board of Agriculture, as representing the Farmers' Union.

National Forestry.—"Forestry aims at continuously productive State forest lands, and the propagation, growth, and exploitation of the ripe timber crops in perpetuity." It is only by the application of silviculture to the national forest lands that the ever-increasing needs of the country may be met. The public safety demands the extension of forest-management to all the Crown woodlands, and the control by one authority of these properties and all other public lands chiefly valuable for forestry.—*Annual Report of State Forest Service*, 1921–22.

CORAL-SPOT, NECTRIA CINNABARINA (TODE) FRIES.*

A WOUND-PARASITE OF FRUIT-TREES.

G. H. CUNNINGHAM, Biological Laboratory, Wellington.

Coral-spot is a fungus widely distributed throughout the world, occurring as a parasite on the living branches of a large number of hosts, and as a saprophyte on dead branches, twigs, &c., remaining on the tree or lying on the ground or on the floor of plantations and in heaps of prunings. Among the many hosts attacked may be mentioned pip- and stone-fruit trees, small fruits, broom (*Sarothamnus*), elm (*Ulmus*), horse-chestnut (*Aesculus*), maple (*Acer*), mulberry (*Morus*), oak (*Quercus*), and silver-birch (*Betula*).

It was long believed that coral-spot was parasitic on currant-canes, as the fructifications of the fungus invariably appeared following wilt and death of the canes. Recent work by Grossenbacher and Duggar (1911) has shown that in this case coral-spot is merely a saprophyte, death of the canes being due to another fungus, *Botryosphaeria Ribis* G. et D.

ECONOMIC IMPORTANCE.

Coral-spot attacks only the woody parts of a tree, and in consequence is not readily noticed by the orchardist, whose chief concern is the marketing of blemish-free fruit. Nevertheless, by the destruction of fruiting-branches, and consequent reduction of output, it has proved serious enough to warrant more notice being taken of its presence. Its effects in an orchard in any one season are generally slight, but under certain conditions it may cause considerable loss by killing large branches, or even entire trees. Such a period occurred in Central Otago during the winter of 1919, when many hundreds of trees, particularly apricots, were killed outright.

APPEARANCE AND EFFECT ON THE HOSTS.

This disease is a wound-parasite, and through an injured surface may infect branches, stems, and laterals, and occasionally roots. Its effects on the host vary according to the position of the point of infection and the severity of attack. If, for example, a single branch is infected it may be killed outright in one season, death being preceded by sudden wilt of the foliage, and shrivelling of any fruit that is present; sometimes, however, an infected branch may live for several seasons, in which case it makes little growth, the leaves being smaller than normal and somewhat yellowish. Although fruit may set on diseased branches it seldom reaches maturity.

Should the stem become infected the tree as a rule is killed outright in the one season. Here infection is followed by sudden wilt of the leaves, and shrivelling of the fruit. These do not fall, but

* Synonyms: *Creonectria purpurea* (L.) Seaver; *Sphaeria cinnabarina* Tode; *Tubercularia vulgaris* Tode; apricot gummosis.

remain attached to the branches until some little time after their death. In such an instance death is invariably preceded by copious gumming.

Death of the branch or tree may be preceded or followed by the appearance of small sunken cankers, but generally the only indication of the presence of the organism is the dying of the branch, followed by a slight shrivelling of the bark. Shortly after the affected portion has been killed small bright-pink pustules appear bursting through the dead bark (Fig. 1). The presence of these pustules, preceded by wilting of the foliage, may be taken as some indication that the damage has been caused by coral-spot; but it is quite possible that the fungus may be present merely as a saprophyte, death of the branch being caused by some other disease, such as valsa-injury or silver-blight.

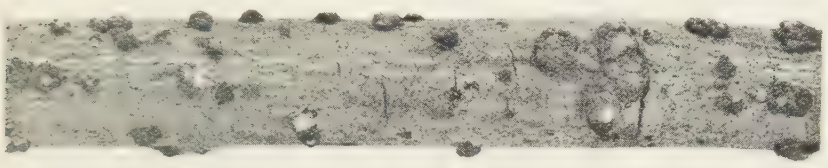


FIG. 1. DEAD APPLE-SHOOT WITH FRUCTIFICATIONS OF CORAL-SPOT.

The light-coloured spots are the pustules of conidia; the dark, perithecia. Natural size.

[*Photo by W. D. Reid.*

LIFE-HISTORY OF THE CAUSATIVE ORGANISM.

Coral-spot is caused by *Nectria cinnabarina* (Tode) Fries., a fungus with two spore stages (conidia and ascospores) in its life-cycle. The conidial stage is produced shortly after the branch has been killed, but the ascigerous stage does not appear until some time after, usually during the winter months.

As it is so commonly found on dead wood, doubt has been expressed as to whether coral-spot is at any time parasitic, some plant pathologists claiming that its association with a cankered area or killed branch is not necessarily an indication that it has been the cause of death, but rather that in such cases it is merely associated with the causative organism, living saprophytically on the dead wood. Mayr (1882), however, has by a series of experiments proved beyond doubt that, given favourable opportunity, it can become a destructive wound-parasite. Spores (ascospores or conidia) produced from fructifications upon dead wood on adjacent trees, or from dead sticks, prunings, &c., lying on the ground, are carried by the wind or other agency to wounds on the branches of living trees. Here, should conditions prove favourable, they germinate and produce a germ-tube which penetrates the tissues of the exposed and dead wood of the wounded areas, where it grows vigorously, branching repeatedly to form a mycelium, the hyphæ of which spread rapidly to the water-conduction vessels of the sap-wood. These vessels are killed and soon completely filled with the mycelium; further upward passage of food solutes being thus prevented, sudden wilt of the portions above the point of entry follows. Apparently the fungus cannot attack living bark or cambium, these tissues dying in consequence of the destruction of the tissues of the sap-wood lying immediately beneath.

Where entry has been effected on a large branch it may be several seasons before the death of that branch occurs. In such a case a canker is formed which gradually enlarges year after year until the branch becomes girdled, when it dies. The conditions essential to the penetration of the host by the fungus are the presence of abundant moisture, and of dead tissues in the wounded area. Throughout this article the term "wound" has been used in the sense of an abrasion in the bark sufficiently deep to expose the sap-wood. It should be mentioned that entry may be effected through any dead area, such as dead laterals, or dead stubs left as the result of careless pruning; in fact, so long as dead tissue is present in any quantity on a tree there is danger of infection. It is recorded that in Europe coral-spot has been known to attack mulberry through buds injured by frost.

FIG. 2. FRUCTIFICATIONS OF CORAL-SPOT. × 20.

Conidial pustule (light-coloured) surrounded by perithecia.

[*Photo by W. D. Reid.*

FIG. 3. SECTION THROUGH CONIDIAL PUSTULE. × 40.

(*con*) Conidial layer; (*pa*) palisade layer; (*st*) stroma; (*e*) epidermis. Camera lucida drawing. Original.

FIG. 4. SECTION THROUGH STROMA BEARING PERITHECIA. × 40.

(*p*) Perithecia; (*st*) stroma; (*e*) epidermis. Camera lucida drawing. Original.

FIG. 5. SECTION THROUGH PERITHECIUM. × 150.

(*os*) Ostiolum; (*par*) paraphyses; (*as*) asci. Note how the asci are embedded in a mass of the hair-like paraphyses. Camera lucida drawing. Original.

FIG. 6. ASCI, ASCOSPORES, AND CONIDIA.

(*a*) Ascus containing spores; (*b*) two-celled ascospores; (*c*) conidia. Camera lucida drawing. (*a*) × 380; (*b*) (*c*) × 500. Original.

FIG. 7. SECTION THROUGH CONIDIAL PUSTULE. × 500.

(*st*) Stroma; (*pa*) palisade layer (shown in Fig. 3 as deeply shaded central portion); (*con*) conidiophores bearing conidia on short lateral branches; (*c*) plant-cells. (In order to enable this section to be shown sufficiently magnified, so that details may be observed, it has been necessary to omit certain portions; these are represented by gaps in the drawing.) Camera lucida drawing. Original.

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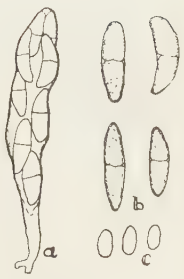

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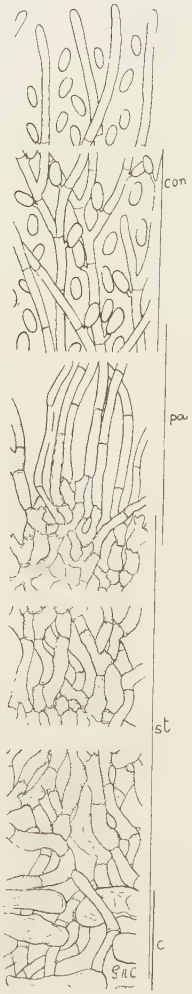

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Spores alighting on the surface of this dead tissue (whether dead wood, bark, or buds) germinate, and for a time the resultant mycelium lives saprophytically, gradually acquiring a quantity of reserve food, and spreading into the living tissues as described. Here it kills the cells by the secretion of certain toxic substances, utilizing the starch-grains stored within these cells, and in their stead depositing a greenish substance—probably some decomposition product—which stains the infected wood a dark colour that is clearly visible when a diseased branch is sectioned.

Upon the death of the limb or branch attacked the organism continues to live as a saprophyte, and from hyphæ situated near the periphery of the wood produces closely woven masses of mycelium, which burst through the now dead cortex and appear on the surface as bright-pink cushion-shaped pustules up to 2 mm. in diameter (Fig 2). A typical pustule consists of a closely woven base of mycelium (stroma) from which upright hyphæ (conidiophores) arise (Fig. 3). Each conidiophore is branched, and on short lateral secondary branches minute colourless spores (conidia) are borne (Fig. 7). Later in the season, from the same stroma arises a cluster of small, dark-red, flask-shaped perithecia (Fig. 4). Each perithecium opens at its apex by a small pore (ostiolum) (Fig. 5, *os*), and contains numerous club-shaped asci, immixed with numerous hair-like paraphyses (Fig. 5, *par*). Each ascus contains eight one-septate colourless ascospores (Fig. 6).

The discharge of ascospores occurs only in the presence of abundant moisture, which causes certain portions of the tissues within the perithecium to become gelatinous. As a result the asci are subjected to pressure and the ascospores forced out into the perithecium, where they become embedded in the gelatinous matter. This continues to swell by the absorption of moisture, and there finally issues through the ostiolum a curled tendril, which is white and quite visible to the eye. In this gelatinous tendril the ascospores are embedded, and are freed as the matrix is dissolved away by the rain. The spores then lie on the surface of the stroma until dry, when they are dispersed by the wind. Should they alight on a suitable substratum they may germinate and produce a mycelium, which penetrates the tissues and in turn gives rise to pustules bearing conida.

REMEDIAL TREATMENT.

From the foregoing it is seen that the organism spreads either from fructifications produced on branches which have been killed by it, or from dead sticks lying on the ground, upon which it may have been living saprophytically. Furthermore, it has been shown that the organism is a wound-parasite, and can attack a tree only through a wounded surface in which dead tissues are present.

Wounds may be due to the following causes: During picking and pruning operations abrasions are sometimes formed on the limbs, and often branches are split at their junction. Laterals may die as a result of the defoliation caused by attacks of leaf-rust or insects (*e.g.*, bronze beetle); or they may be killed by frost injury, as was abundantly evident in Central Otago in 1919. Cankers may be formed in shoots and branches by woolly aphis and other insect pests. Apricots commonly have large crevices in their stems, formed as the

result of gumming. All these injured areas afford excellent opportunity for the penetration of the spores of *Nectria*.

The following preventive treatment is recommended : During pruning operations remove all dead wood from the trees. Pick up and burn all prunings, and burn all old heaps of rubbish adjacent to the orchard, thus minimizing spore-production. Trim all rough edges of wounds ; and cut off stubs of broken branches close to the main stem, so that they may readily callus over. Where a branch has been split at the crotch it should be bound up, or else cut out altogether. Deep and narrow crevices should be filled with grafting-wax or some such suitable matrix. Gum-pockets should be cut out. Finally, all exposed surfaces should, as soon as made, be coated with coal-tar, care being taken to prevent the tar from running on to the healthy bark. All wounds should be painted annually until such time as they callus over. This is a necessary precaution, as all large wounds have a tendency to crack and expose wood uncovered with any protective coating.

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SOME EXPERIMENTS IN AFFORESTATION ON THE WAIOTAPU-TAUPO PLAINS.

E. EARLE VAILE, "Broadlands," Waiotapu.

HAVING always been a lover of trees, one of my first operations after fixing the site of "Broadlands" homestead in June, 1907, was to procure from Auckland and plant out about a hundred *Pinus insignis*. These, transferred from so soft a climate, were severely frosted back, but all ultimately recovered and grew into good trees. The next year I bought *Pinus insignis* and *Cupressus Lawsoniana* in Dunedin. They stood the journey well, soon started a good growth, and were not affected by frost. However, the expense was too great for operations on a considerable scale. At that time I could not purchase a single tree locally, so it comes about that the great bulk of trees on "Broadlands" have been raised from seed on the place, and this is undoubtedly the best plan in most cases.

If the directions given in some recent publications of the State Forest Service are followed carefully there should be very few failures,

but planters must recognize that success cannot be achieved without taking trouble. More information is required, however, regarding vermin-control. A hare will run along a row of tree-seedlings, eating none, but nipping dozens off close to the ground. Rabbits will scratch very many out, and nibble others down. For this reason during several years I planted out no seedlings, but only two-year-olds. However, this plan proved very expensive, and I have now netted in 700 acres. The Forestry authorities might suggest some cheap and effective method of combating this great scourge of private planters; for instance, would spraying with certain mixtures protect the young trees? Of course, this is a question that hardly affects the State Forest Service itself. The latter utilizes great areas of virgin scrub where there are very few hares and rabbits, and little to attract them. Compare these conditions with those of a settler with paddocks which he wants to shelter with trees. His shelter-belts will be only a chain or two wide, and will be either between two paddocks or between his paddocks and the scrub. The vermin run across them continually from their shelter in the scrub to their feeding-grounds in the paddocks, or from one paddock to the other. So good-bye to seedling trees!

For two years I had great success with the drilling-in of eucalypts. The land was ploughed out of the scrub and prepared as for turnips. I tried *Eucalyptus viminalis*, *E. acervula (ovata)*, *E. Macarthuri*, *E. Gunnii*, *E. obliqua*, *E. fastigata*, and *E. gigantea*, mixing the seed at the rate of ½ lb. to the acre with manure at the rate of 75 lb. to the acre, sowing through the two outside coulters only, and leaving 9 ft. or 10 ft. between the wheel-marks on the return trip. A very large area is thus covered in a day. Of these varieties *viminalis*, *acervula (ovata)*, and *Gunnii* proved an outstanding success, *Macarthuri* a qualified success, and the others a failure. They germinated fairly well, but the winter frosts finished them off. Their only chance would be under a semi-shelter. In the case of the three successful varieties I found ½ lb. to the acre too heavy a seeding; ¼ lb. would be plenty. One most astonishing thing was that the vermin left these three varieties growing *in situ* from the seed absolutely alone. Had they been transplanted, undoubtedly the majority would have been destroyed. The same peculiar immunity applies to pines self-sown through the scrub. *E. Macarthuri*, drilled and treated in the same way in all respects, germinated not one-tenth the germination of the successful varieties, and the young plants were to an appreciable extent attacked by vermin. *Pinus insignis* treated similarly, only sown a little deeper in the soil, has been an absolute failure on all occasions.

Last spring my drilling of eucalypts and *Cupressus macrocarpa* was a fair success, but the two previous seasons were failures, due to rainless weather. Owing to the exceeding smallness of eucalypt-seeds they must be sown practically on the surface, and rain is necessary to germinate them and keep them growing for a while.

I have also had success with *E. viminalis* and *E. acervula (ovata)* sown by hand with a little manure on prepared ground, and harrowed in with a chain harrow—just the same as grass-seed.

It may be helpful to other beginners in this and similar areas if I tabulate the results of my experiments as follows:—

Variety.	Number of Trials.	Germination (in Seed-beds).	Comments.
		Eucalypts.	
Viminalis	Numerous	Excellent ..	Quite hardy ; fast grower ; easily transplanted ; timber said to be durable and strong.
Acervula (ovata) ..	Numerous	Excellent ..	Quite hardy ; fast grower ; easily transplanted ; no definite information about timber.
Gunnii	Several ..	Excellent ..	Quite hardy—in my experience never been frosted ; fast grower ; easily transplanted. Care necessary to get right seed ; buy from State Forest Service, Whakarewarewa.
Macarthuri	Numerous	Excellent ..	Very hardy—in my experience never been frosted ; fast grower ; fairly easily transplanted ; said to be valuable timber. Perhaps the best of all eucalypts for this district.
Amygdalina (N. S. Wales variety)	Numerous	Excellent ..	Quite hardy ; fast grower ; not easily transplanted ; very graceful.
Amygdalina (Tasmanian variety)	Several ..	Excellent ..	Cut back by frost ; not a success.
Coriacea	Numerous	Excellent ..	In my experience never been touched by frost ; fast grower ; easily transplanted ; graceful ; timber not straight, but useful for firewood, &c.
Coccifera	Several ..	Good ..	Quite hardy ; only a scrubby growth ; useless.
Stuartiana	Several ..	Excellent ..	Quite hardy ; quick grower ; easily transplanted ; timber said to be not durable.
Gigantea (delegatensis)	2	Excellent ..	Not hardy in exposed positions ; quick grower ; easily transplanted ; a handsome tree.
Obliqua	Several ..	Excellent ..	Will not stand moderate frost ; useless.
Fastigata	2	Excellent ..	Easily killed by frost ; useless.
Muelleriana	2	Good ..	Fairly hardy ; not easy to transplant.
Muelleri	2	Fair ..	Hardy ; very slow grower ; useless.
Urnigera	2	Fair ..	Hardy ; very slow grower ; useless.
Stellulata	1	From plants	Hardy ; good grower ; seems useful sort.
Regnans	2	From plants	Only fairly hardy.
Globulus	1	From plants	Quick grower, but frosted back every winter.
Bosistoana	1	From plants	A failure.
Maculosa	1	From plants	A failure.
Numerosa	1	From plants	A failure.
Aggregata	1	From plants	A failure.
Eximia	1	From plants	A failure.
Albens	1	From plants	A failure.
		Cypresses.	
Macrocarpa	Several ..	Good ..	Hardy ; good grower ; fairly easily transplanted ; does better if sheltered from south wind ; beautiful timber ; excellent shelter.
Lawsoniana	Several ..	Good ..	Quite hardy ; slow grower ; easily transplanted ; useful only for bottom shelter or for ornament.

Variety.	Number of Trials.	Germination (in Seed-beds).	Comments.
		Pines.	
Insignis (radiata) ..	Numerous	Splendid ..	Quite hardy; very fast grower; very easily transplanted; splendid shelter; useful timber; a good self-sower. Taken all round, the best tree to plant.
Muricata	1	Good ..	Quite hardy; fast grower; easily transplanted.
Laricio	2	Good ..	Quite hardy; slow grower; easily transplanted.
Ponderosa	2	Good ..	Quite hardy; slow grower; easily transplanted.
Ponderosa (var. *scopulorum*)	2	From plants	Quite hardy; very slow grower; useless.
Pinaster	Several ..	From plants	Quite hardy; good grower; easily transplanted; a good self sower; will survive moderate scrub-fires; timber not straight; inferior.
		Sundry.	
Sequoia sempervirens ..	1	From plants	Not a success.
Pseudo-tsuga Douglasii (Oregon pine)	Several ..	Fair ..	When young rather subject to frost; very subject to attacks of hares and rabbits; slow grower at first, then rapid; timber excellent; very useful tree.
Thuya gigantea ..	1	Fair ..	Quite hardy; a handsome tree.
Robinia pseudo-acacia (prickly acacia)	2	Good ..	Hares eat it right out.
Acacia decurrens (black-wattle)	2	Good ..	Hares eat it right out; difficult to transplant; not frost-resistant in exposed places. Immerse seed in boiling water, allow to cool, and sow before seed gets dry.
Willows (weeping) ..	Numerous	From branches	By running water succeeds well; in open paddocks many failures.
		Ornamental Trees, Palms, &c.	
Cryptomeria japonica ..	2	From plants	Hardy; an elegant tree.
Silver-birch	2	From plants	Hardy; an elegant tree.
Cedars (*Libani* and *Deodara*)	1	From plants	Hardy; both elegant trees.
Oaks	2	From plants	Hardy; very slow growers. She-oaks failed.
Yellow-kowhai ..	1	Good ..	Quite hardy; easily raised and transplanted; beautiful tree. Immerse seed in boiling water, allow to cool, and sow before seed gets dry.
Cordyline indivisa (bush flax)	1	From plants	Quite hardy; highly ornamental; rather subject to unexpected death after well established.
Chamaerops excelsa (Japanese fan palm)	2	From plants	Quite hardy; slow growing; very ornamental. The only palm that will succeed in the open in this country.

To sum up my experience: For timber purposes the best trees to grow in this locality are *Pinus insignis (radiata)*, *Eucalyptus Macarthuri*, *E. viminalis*, *E. Gunnii*, *E. acervula (ovata)*, and *Pseudo-tsuga Douglasii* (Oregon pine). For shelter any of these, and for a bottom or inside shelter *Cupressus macrocarpa* and *C. Lawsoniana*. For ornamental purposes any of the foregoing, and also those recommended in the schedule. *Pinus insignis* seems to do best where the soil is driest and poorest. Eucalypts seem to prefer firmer and moister soil.

As a practical illustration of what this country will do in timber-production, I may say that I am now constructing an outbuilding with timber milled out of trees grown from seed which I myself sowed within the last fifteen years. The timbers are *Pinus insignis* for boards and eucalypts for framing.

The result of fairly numerous experiments on a considerable scale is to convince me that, on the average of chances, it pays better to raise seedlings in a bed and transplant them. In the permanent plantation I place the rows 10 ft. apart, and the trees 6 ft. apart in the rows. This is an enormous saving, as compared with the 6 ft. by 6 ft. planting, in every way—in raising seedlings, preparing holes, transplanting, and thinning. I estimate that it reduces the cost of mature timber to less than a half—probably to a third—and it virtually has no drawbacks. I have seen *Pinus insignis* (at Matamata and near Hamilton) originally planted as wide as 16 ft. by 12 ft., and apparently never touched in the meantime, cut out beautiful tall straight boles, 140 ft. of milling length without a knot, and yielding up to 5,500 ft. superficial per tree.

NATURAL REAFFORESTATION.

Before concluding I would like to say a word about the regeneration of forest, both native and exotic, which is going on in this district quite unaided by man. As witnessed by the great number of totara fragments through the scrub, it is certain that the great Kaingaroa Plains were once covered with dense totara forests, and that they were destroyed from time to time by fire. On portions of the area native forest is endeavouring to re-establish itself. Over the whole area exotic pines—*insignis (radiata)* and *pinaster*—are spreading in a surprising manner. Left alone, ere long this vast area will cover itself with valuable timber. Helped by man it will be covered much more quickly and with more valuable trees. The great enemy is fire. Lighting a scrub-fire in this country should be made a criminal offence with severest penalties, and fire rangers should be appointed to make punishment for the offence certain as well as severe.

Importation of Fruit or Plants from the United Kingdom.—The regulations under the Orchard and Garden Diseases Act, 1908, governing the importation of fruit or plants into New Zealand have been amended as regards the certificates required to accompany plants from the United Kingdom. The provision that the director of any public or botanic gardens in the United Kingdom might sign the certificate of fumigation and dipping, or of freedom from disease, in regard to such plants has been withdrawn, and such certificates must now be signed by an officer of the Ministry of Agriculture or other Department performing the functions relating to horticulture.

TESTING OF PUREBRED DAIRY COWS.

NOVEMBER CERTIFICATE-OF-RECORD LIST.

THE following list, comprising the records of cows which qualified for certificates during November, 1922, is supplied by the Director of the Dairy Division, Mr. W. M. Singleton :—

LIST OF RECORDS.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Viola's Frisky ..	A. L. Hooper, Mahoe	2 80	248·5	329	8,495·4	551·28
Lady Gleam of Rosy Creek	A. Hudson, Levin ..	2 58	246·3	365	10,331·0	500·73
Koro Koro's K.C. Belle	R. W. Southee, Kiwitea	1 305	240·5	365	7,318·6	461·34
Lochgarra Rose ..	E. J. Sultzberger, Mangatoki	2 56	246·1	350	7,867·25	460·11
Onaero's Bilberry ..	H. Wells, Hawera ..	1 345	240·5	365	8,432·5	457·13
Orange Dale's Larkspur	W. J. Hall, Matatoki..	2 27	243·2	347	7,156·7	437·92
Ladywell Peggotty ..	W. J. Murray, Otakiri	2 16	242·1	358	8,734·0	429·62
V.A.D.	A. R. Clark, Hamilton	1 338	240·5	365	7,690·3	426·14
Waipuna's Peace ..	H. C. Wallace, Tamahere	2 58	246·3	365	7,018·7	417·10
Koro Koro's Marigold	R. W. Southee, Kiwitea	1 338	240·5	365	7,362·1	415·77
Thornycroft Shamrock	S. J. Bennett, Kaupokonui	1 355	240·5	355	6,662·6	407·98
Orange Dale's Bonnie	W. J. Hall, Matatoki..	2 36	243·1	352	7,251·4	402·14
Aberbrothock Rimu	A. R. Valder, Arapohue	2 26	243·1	332	7,327·7	395·23
Miro Meadow's Jean	R. J. W. Hancock, Waitara	2 0	240·5	365	6,027·4	371·64
Koro Koro's Daisy ..	R. W. Southee, Kiwitea	2 19	242·4	363	6,732·7	367·86
Orange Dale's Olga..	W. J. Hall, Matatoki..	2 53	245·8	294	6,459·6	367·42
Orange Dale's Pansy	W. J. Hall, Matatoki..	2 4	244·9	355	6,752·6	349·68
Orange Dale's Concord	W. J. Hall, Matatoki..	2 30	243·8	351	6,240·7	344·80
Lochgarra Dorrit ..	E. J. Sultzberger, Mangatoki	1 325	240·5	342	5,781·75	338·70
Coronella	W. Fergus, Ruawhata	1 333	240·5	322	6,456·2	336·98
Sunlight's Delight ..	W. Fergus, Ruawhata	2 10	241·5	365	5,517·2	303·46
Sylvian Dolce ..	A. Mouldey, Tirau ..	2 19	242·4	338	3,774·2	284·31
Rewa Arabis ..	G. B. Hull, Wellington	2 18	242·3	296	5,585·4	253·33
Senior Two-year-old.						
Koro Koro's Banksia Rose	R. W. Southee, Kiwitea	2 362	276·7	365	9·188·2	444·20
Wotton Sandaisy ..	S. R. Lancaster, Palmerston North	2 131	253·6	363	8,243·75	437·38
Plush	W. Fergus, Ruawhata	2 334	273·9	365	8,393·3	420·00
Three-year-old.						
Rosebud's Molly ..	E. Bennett, Cardiff ..	3 339	310·9	365	12,005·0	589·26
Worry	A. R. Valder, Arapohue	3 31	243·6	365	8,392·9	498·87
Onaero's Lassie ..	H. Wells, Hawera ..	3 4	277·4	340	6,501·0	448·94

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS—*continued.*						
		Yrs. dys.	lb.		lb.	lb.
Four-year-old.						
La Padua	O. Monrad, Palmerston North	4 37	317·2	365	10,215·8	523·15
Miss Linda ..	R. D. Dagg, Kaponga	4 299	343·4	365	6,768·9	437·99
May of Bulls ..	S. R. Lancaster, Palmerston North	4 352	348·7	351	7,458·75	393·72
Mature.						
Factory Maid ..	H. B. Lepper, Lepperton	9 40	350·0	365	12,082·85	648·65
Emilia	A. and J. O'Donnell, Hawera	5 9	350·0	365	11,733·6	595·89
Limpy's Mamy ..	H. B. Lepper, Lepperton	8 40	350·0	365	12,082·4	549·83
Delight of Willowbank	F. Ranford, Stratford	5 15	350·0	362	10,821·8	537·62
Genoa Chase ..	W. J. Hall, Matatoki ..	9 10	350·0	365	9,606·3	533·81
Maori Spot ..	E. J. Sultzberger, Mangatoki	6 320	350·0	363	8,838·5	474·86
Suzette of Sedgebrook	A. Hudson, Levin ..	5 161	350·0	355	9,081·0	462·13
Snow View's Rosebud	K. Rothe, Kaponga ..	5 0	350·0	322	7,213·5	381·71
Frisky's Magnolia ..	A. Eddie, Mangahao ..	9 345	350·0	365	7,687·0	364·37
FRIESIANS.						
Junior Two-year-old.						
Ashlynn 54th ..	R. Marr, East Tamaki	1 352	240·5	365	12,849·4	520·53
Wyndham Trilby League	Gibb Bros., Clifton ..	2 13	241·8	364	14,479·05	500·17
Dominion Forest Queen	Central Development Farm, Weraroa	1 331	240·5	365	13,749·7	489·28
Dominion Lady Piebe	Central Development Farm, Weraroa	2 33	243·8	334	9,232·1	325·78
Senior Two-year-old.						
Dominion Patchwork	Central Development Farm, Weraroa	2 341	274·6	365	14,821·2	477·83
Dominion Jessie Fobes	Central Development Farm, Weraroa	2 330	273·5	355	13,501·9	433·69
Dominion Miss Mierlo	Central Development Farm, Weraroa	2 339	274·4	343	13,612·2	415·03
Dominion Thelma Kruger	Central Development Farm, Weraroa	2 264	266·9	365	10,861·1	385·70
Junior Three-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·3	800·18
Dominion Edingcrest	Central Development Farm, Weraroa	3 173	294·3	365	12,264·4	435·03
Dominion Domino ..	Central Development Farm, Weraroa	3 10	278·0	343	10,987·1	384·79
Dominion Daisy Woodcrest	Central Development Farm, Weraroa	3 12	278·2	330	12,093·8	374·65
Senior Three-year-old.						
Dominion Rene ..	Central Development Farm, Weraroa	3 335	310·5	365	12,166·0	388·10
Pearl of Norfolk Park	W. Potter, Mangere ..	3 203	297·3	354	11,017·6	358·36
Junior Four-year-old.						
Dominion Mierlo II ..	Gibb Bros., Clifton ..	4 12	314·7	328	12,921·3	430·55

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS—*continued*					
Senior Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Rosevale Rocca Posch	North and Sons, Omimi	4 339	347·4	365	20,912·2	682·93
Dominion Jocrest ..	Central Development Farm, Weraroa	4 306	344·1	365	19,525·0	639·48
Holland Queen Ena..	C. H. L. Holmes, Pihama	4 276	349·0	349	14,230·1	480·56
Mature.						
Dominion Pauline ..	Central Development Farm, Weraroa	7 327	350·0	365	21,692·3	695·19
Coldstream Star ..	Marchant and Sons, Cardiff	5 363	350·0	365	17,510·1	648·32
Woodcrest Netherland Princess	Marchant and Sons, Cardiff	6 290	350·0	300	17,251·4	621·22
Dominion Margaretha	Central Development Farm, Weraroa	6 47	350·0	340	15,188·7	486·31
Pietertje Netherland Belle	Jones Bros., Kuripuni	6 296	350·0	365	13,897·7	382·34
	MILKING SHORTHORNS.					
Mature.						
Ellesmere Lady Oswald V	J. Bateman, Invercargill	..	350·0	365	13,383·3	532·58
	AYRSHIRES.					
Two-year-old.						
Lassie of Glenalvon ..	J. Bowden, Matamau	2 354	275·9	365	8,134·8	382·70
Three-year-old.						
Duchess III of Glenalvon	J. Bowden, Matamau	3 267	303·7	365	9,279·7	424·27
Darkie of Pukeoware	W. K. Lawton, Pukeoware	3 310	308·0	357	8,548·5	348·69
	RED POLLS.					
Two-year-old.						
Dominion Silken Lashes	Central Development Farm, Weraroa	2 58	246·3	365	7,229·6	382·36
Dominion Sylvania ..	Central Development Farm, Weraroa	2 58	246·3	326	8,133·2	359·73
Dominion Briar Rose	Central Development Farm, Weraroa	1 351	240·5	324	6,884·2	315·24
Dominion Red Cuban	Central Development, Farm, Weraroa	1 314	240·5	340	6,613·5	292·09
Three-year-old.						
Eyrie	Central Development Farm, Weraroa	3 88	285·8	365	8,338·7	370·48
Four-year-old.						
Neutral	Central Development Farm, Weraroa	4 353	348·8	338	9,591·4	416·01
Mature.						
Table Mount ..	Central Development Farm, Weraroa	5 357	350·0	310	11,350·0	480·65
Sylph	Central Development Farm, Weraroa	7 53	350·0	302	10,362·0	461·77
Uralia	Central Development Farm, Weraroa	5 57	350·0	355	10,253·1	424·97

Second-class Certificates.

JERSEYS.

Mature.						
Silver Pride ..	J. S. Rae, Taneatua ..	5 262	350·0	364	7,668·0	448·81

SEASONAL NOTES.

THE FARM.

FIELD CROPS AND PASTURES.

North Island.

Feeding of Dairy Cows.—Early-sown crops for this purpose will be ready in January, and where grass pasture is at all scarce a start should be made at once so as to prevent the cows going back. The art of supplementary feeding lies in commencing it while the cows are still milking well. Once the cow goes back at this season of the year there is little chance of getting the yield up again. Soft turnips will be one of the main fodders in many districts, and great care should be observed in feeding them. In no case should the herd be turned on to the crop. The turnips should be pulled and carted out, and the cows fed immediately after milking. Pulling should be done at least twelve hours before feeding, and not more than 40 lb. per cow given at first. Later the allowance may be increased to 60 lb. Early-sown millet will now be about ready for feeding-off. Red clover should also be throwing a good deal of feed.

Root Crops.—Swedes will be sown about the end of the present month. Some farmers complete their sowings before Christmas, while many favour the last week of December, especially in south Auckland. Results indicate that Christmas week is to be recommended, if the weather will allow. In some districts swedes may still be sown in January, particularly in the higher situations. In other locations turnips will give better results, good varieties being Hardy and Imperial Green Globe. Manure should be mostly superphosphate, as a very soluble manure is required at this time of the year. Apart from roots, millet and sorghum can also be sown after New Year for fodder purposes.

Growing crops of mangolds and carrots should have special attention, and where not already done thinning should be pushed forward. January is the month when cultivation tells, and it should be frequent so as to destroy weeds and retain moisture. Where the drills are wide enough it will greatly benefit the crop if the horse-hoe is run through every week or ten days from now on until the leaves are too close to allow of further work. In cases where a mangold crop is not making proper growth it will often be greatly benefited by a top-dressing of nitrate of soda at the rate of 1 cwt. per acre.

Haymaking.—A good deal of meadow hay has been cut in the present month, but in the wetter districts haymaking will be general during January. The weather is frequently broken, and under such conditions great judgment must be exercised. Hay will keep a long time in the swathe, but once it has been turned it will stand very little bad weather; consequently it is better not to turn it unless the weather appears to be sufficiently settled to allow of its being saved. There are, of course, exceptions to this rule; if the crop has been down a considerable time, and the aftermath is beginning to grow through it, turning must be risked to avoid a complete loss. If the weather is favourable the best method is to cut, allow the material to lie one or two days, then turn and stack almost at once, a heavy crop requiring a little more time than a light one.

It is usually desirable to add salt to hay-stacks, especially in dairying districts. Besides helping to preserve the hay, it is one of the simplest ways of feeding salt to the stock. The poorer the quality of hay the more salt required; generally from 8 lb. to 10 lb. per ton of hay will be sufficient.

For the stack pick a dry well-drained site, and make a bottom of rails, poles, tree-branches, or similar material, spreading straw or litter on top. An oblong stack is the best shape. As the material goes on it should be tramped

firmly and built out, so that the eaves project and make the area of the bottom smaller than that at the eaves. A stack 30 ft. by 18 ft. built 12 ft. to the eaves should represent about 25 tons of meadow hay.

Lucerne Hay.—The proper time to cut lucerne is when the crop commences to bloom. There is a considerable difference in food-value between hay made from lucerne commencing to flower and a crop fully in bloom. As the lucerne-plant commences to bloom young fresh growth will be noticed coming away from the crown of the plant. These shoots grow rapidly, and represent the succeeding growth. If cutting the crop is overdelayed these shoots grow to such a length that when the crop is eventually mown the tops are nipped off, and the subsequent growth will thus be retarded. One important point in cutting lucerne at the proper time is the fact that in so doing the leaves, which are the most nutritious portion of the plants, adhere much better to the stalks, and are not lost in the process of haymaking. The principles of meadow-hay-making apply generally to the making of hay from lucerne.

South Island.

Corn Harvest.—Except in some of the more southern districts, harvest operations will be general during January. The less-experienced may be reminded that, when cut, cereal crops should be stooked as quickly as possible. Stooks should not be built too large, from twelve to fourteen sheaves being sufficient. Care must also be taken to see that they are put up as firmly as possible, so that they will not topple over with the first gale of wind. It should also be remembered that a well-built stook will turn a considerable amount of rain, whereas a badly built one will take all that is offering.

There is every indication that rust will be prevalent in the drier districts this season. In Canterbury mildew often causes damage in wheat crops. It seems to attack plants that have already received a check owing to dry weather. It appears as greyish-white spots on the glumes, and has a detrimental effect on the final filling of the grain. At present there is no remedy. Take-all is likely to be the most dangerous disease so far as Canterbury is concerned. The first indication of this trouble is a premature whitening-off in patches, and the grains fail to mature. To find take-all the outer leaves are stripped off near the ground, where, if present, it will be seen as a dark sooty powder between the first node and the ground. There is no cure for this disease, but its spread the next season can be controlled by a change of crop in the field affected. It is unsafe to plant wheat on such land for at least three seasons. Instances have come under notice where this advice has been disregarded, with the result that in the next season the whole area was infested.

Seed Crops.—Fields of rye-grass, cocksfoot, and clover shut up earlier in the season should be ready for seed-harvest between January and February. Harvesting of peas and vetches should also take place, weather permitting.

Cocksfoot may generally be harvested during January. To get best results and a high germination harvesting should be delayed till the seed is ripe. In recent seasons many samples from Banks Peninsula have been inferior both in quality and germination, owing to careless harvesting, insufficient discrimination having been made between sunny and dark faces.

The vetch-seed crop requires very careful handling, and great attention should be paid to cutting, as if cut too ripe there is sufficient plant-food in the succulent stem to mature the seed on the ground, and a big percentage will be lost. As a general indicator, the pod should be split, and when it is seen that the seed is beginning to brown-off where it joins the pod the crop is ready to cut. This indicator must be used with discretion, however, allowing for variation in soil conditions. When cut the crop should not be handled more than is absolutely necessary. Oats sown with vetches must be regarded as support only, and as giving no indication as to time to cut. An ordinary pea-huller may be used for threshing vetches.

Lucerne should be cut for seed when the pods are almost ripe. If cutting is too long delayed much of the seed will be knocked out in the process of harvesting and fall to the ground. A clover drum serves quite well for threshing lucerne. Marlborough is undoubtedly *par excellence* the lucerne-seed-raising district of the Dominion. The raising of lucerne-seed in Canterbury has not proved satisfactory in general, owing to the uncertainty of the late-summer

weather, and local farmers cannot be advised to try the crop commercially. The best crop for seed purposes in this district is the second growth of the season, but even this is seldom successful owing to dry weather being followed by summer rains, causing another growth, which prevents the crop from ripening evenly.

Fields which have been cut for hay and which show a sufficient growth of red clover may be shut up and allowed to go for clover-seed.

Cultivation.—Land intended for early spring or winter green feed should be ploughed and prepared. Especially does this apply to Plains light country in Canterbury. Advantage should be taken of the hot summer weather and the north-west winds to kill all weeds, especially twitch, which is so prevalent on a large area of Canterbury arable land. Intercultivation of all crops should be continued wherever possible. It is of the utmost importance to keep down weeds, at the same time conserving moisture and aerating the surface soil. The young turnip crops in particular will benefit by such treatment.

Turnip Crops.—One of the most important of farm operations at this time of year, particularly in Otago and Southland, is the finishing of turnip-sowing. Swedes should be chiefly sown during this month, to make provision for late spring feeding. On account of their higher percentage of solids and firmer flesh they hold over better than the ordinary turnips. Where land is known to be infected with dry-rot it should not, under any consideration, be sown down in swedes. If for economic reasons turnips must be grown on infected land, then it is preferable to sow some variety of smooth-skinned, white-fleshed, quick-maturing turnip that can be fed-off early in the season, before the effects of the disease become pronounced.

By the time late turnip-sowing is completed, that part of the crop sown earlier in the season will be ready to single. This is a feature of turnip-growing often neglected by farmers, under the impression that the increased yield from a singled crop does not warrant the labour necessary. Such an impression is erroneous, and there is no doubt that the successful turnip-grower is he who either by machine or by hand-hoe systematically singles his crop. A point to be borne in mind is the necessity for singling the plants before they become too large. If this operation is delayed a serious check will result, and a poor crop will most probably be obtained.

Provision of Hay.—The importance of providing a good supply of hay for winter feeding in conjunction with turnips is, unfortunately, not always realized —particularly so in Southland. It will be to the dairy-farmer's advantage to make ample provision of hay, enabling him to keep his cows in good health during the winter, and have them commencing their milking season in good condition.

The remarks on haymaking and lucerne hay given under the heading of North Island apply, of course, to the South also.

—*Agricultural Instruction Service.*

POULTRY-KEEPING.

CLEANING UP THE PLANT: CONTROL OF VERMIN.

With all stock hatched and the young chickens past the real danger period, every opportunity should be taken to clean up the plant and do any odd jobs which may have been neglected during the busy season of hatching and rearing. Dirt means encouragement of insect vermin and disease, and when these make their appearance poor returns follow as a matter of course. At no other time of the year will vermin multiply as they will in the warmer months. A fact to be remembered in this connection is that it is natural for a fowl to harbour vermin. To keep them in check continued vigilance is therefore imperative at the present time. All dirty litter and nesting-material should be removed, and before this is renewed give every part of the interior of the house a thorough spraying with disinfectant. This will have the effect of keeping in check red mite and fleas, which hide during the day and attack the fowls by night.

Dust-baths should also be provided to enable the birds to free themselves from body-lice, which live on the fowls at all times. Body-lice are certainly not so harmful as red mite, but nevertheless they should be discouraged in every possible way. No poultry plant is complete unless a dusting-place is available

to the birds at all times. It is really nature's method of enabling a bird to free itself from parasitic life, and it is surprising how few poultry-keepers realize this fact. There is no place a bird delights better to dust in than a spaded-up piece of ground on the sunny side of a shrub in the run. Any dust-bath should be frequently turned over, as slightly moist earth is greatly appreciated by the birds, especially during hot weather. Where a dusting-place is provided under cover it will not be appreciated by the birds unless it is frequently freshened up by the addition of new material, and kept moist by means of a spray of water.

When a bird's beak is seen to be continually working among its feathers the presence of body-lice may be regarded as certain. It is not generally known that in the majority of cases the habit of feather-pulling is due to irritation caused by heavy infestation of lice or mites, especially where the birds are being kept under closely confined conditions. Strict attention to cleanliness, constant warfare against vermin, and giving the birds ample range are among the essentials for preventing the acquisition of this bad habit.

Broody hens should not be allowed to remain on the nest day after day. This not only means a loss in eggs, but it encourages the presence of insect pests. Immediately a bird is found on the nest by night it should be removed to the broody-coop. If this course is taken the desire to sit will probably be broken in two or three days, whereas if the hen is left on the nest longer it may take at least a week for the broody fever to pass. The floor of a broody-coop should be made of battens—say, about 1 in. apart. It should also be raised a few inches above ground-level. This allows of a free circulation of cold air under the bird, which rapidly assists towards breaking the desire to sit.

CARE OF THE YOUNG STOCK.

It should be needless to remind readers that the present period is a very trying one for young stock. This involves the necessity for good feeding and careful management, in order that there may be no check in development. Shade is a valuable asset in hot weather; indeed, young stock cannot possibly thrive without it.

Upon the treatment a pullet receives during the developing-period very largely depends her success as a layer. A common mistake, in these days of running a large number of stock in a confined space, is to keep the young birds under what might be termed hothouse conditions. The consequence is that they are overforced, and therefore have not the necessary stamina demanded of the profitable laying-bird. All young stock should have as much range as possible, in order that a maximum amount of exercise may be taken, the exception, of course, being birds that are being prepared for market.

Another fault in developing the layer is in overforcing it by means of stimulating foods such as meat, milk, &c., with a view to bringing it to a laying-point at an early age. Early maturity is all very well in its way, but the poultryman can pay too dear a price for it, as disaster may easily follow in its train. Such birds are more susceptible to disease, to variation of condition, and generally have not the same strength for heavy egg-production as the properly developed bird that comes to lay in a natural way. Besides, the bird forced to maturity will never grow to a desired size, nor can it be depended upon to lay a good marketable-sized egg. By all means breed to secure early-maturing stock in season, but let nature take its course as to the time the laying-period should commence. Generally speaking, about six months is the proper time for a bird of a laying-strain to start her laying season, and this may even be extended in the case of the heavier breeds.

PTOMAINE POISONING.

In the last October number of the *Journal* the matter of fowls dropping dead from no apparent cause was dealt with. Sometimes fowls die in a similar manner from ptomaine poisoning. This is what is usually termed by poultrymen "limberneck," for the reason that an affected bird loses control of the neck-muscles, which sometimes causes the bird to become bent forward to such an extent that it almost touches the ground. The writer has made many post-mortem examinations of birds affected in this way, and in almost every case it was observed that the neck had a decided twist. This, however, is merely a symptom, indicating a derangement of the digestive system due to ptomaine poisoning. The eating of putrid meat, decayed vegetables, mouldy bread, &c., are common causes of this trouble. The worst case of the kind that has come

under my notice, and where the mortality was great, was solely due to the birds having access to a hole in the ground where dead fowls, decaying vegetables, &c., were thrown from time to time. Where the symptoms mentioned are observed the only safe course is to endeavour to clear the bird's system of the poison. For this purpose there is nothing better than a dose of Epsom salts. Give about a 1 oz. packet for every twelve birds in the affected pen, dissolving the salts in the water with which the mash is mixed. Of course, as with most other troubles which affect poultry, prevention is the only safe course of dealing with this one, and the first thing necessary is to find the cause and remove it. In particular one should make sure that there are no dead carcases or tainted matter lying about, and that unwholesome foodstuffs are not supplied.

—*F. C. Brown, Chief Poultry Instructor.*

THE ORCHARD.

SYSTEM IN PACKING.

THE apple harvest will commence shortly, and there is little time left in which to complete necessary preparations. Extra hands have to be engaged for the busy season, and a little forethought is necessary to carry out the work with care and economy. The packing-shed should be cleared of any lumber that may have accumulated, and all machinery put in good repair.

The arrangement and working of some of our packing-sheds leave much to be desired, and it is here perhaps that some of the greater economies may be made. The practice of packers having to place the packed box of fruit on the floor, and the nailer having to lift them again one by one, nail them down, and again place them on the floor, from which they are again lifted, stencilled, and wired before being placed in the stack for despatch, has very little to recommend it. It is extravagant in labour and takes up a great amount of floor-space, while, as is well known, the excessive amount of handling is detrimental to the fruit.

A better arrangement is where the packers work beside a conveyer, on which they place the boxes of packed fruit. These are gently rolled along to the nailer, who does his part, and, without placing them on the floor, passes them on to the operator who stencils and wires the case, thus completing the package. In this way the work is performed more expeditiously, with less injury to the fruit, and a great economy of floor-space. The conveyer is often home-made of wooden rollers, or in very small sheds it consists of a bench, the top of which takes the form of two parallel wooden rails.

Time and space can also be saved by supplying packers with the necessary boxes close at hand. The idea is illustrated and described in an article in the July, 1921, issue of the *Journal*. The arrangement there described enables a packer to lay his hand on a required box at any time without taking a step away from his bench. It is a very great economy in labour and floor-space compared with the methods found in some sheds, where the packer has to walk a distance for his cases and sort them out for himself, the faulty boxes lying around until they are removed again. Good packing-tallies are not to be expected under such conditions.

In these and other ways the extra labour of harvest-time can be reduced, and the congestion of the packing-sheds relieved.

SPRAYING, ETC.

However busy one happens to be, time must be taken to have a quiet look round and note developments. Success depends as much on vigilance as on effective action. Brown-rot is a likely visitor to the stone-fruit areas. As soon as it appears collect infected fruit and twigs, and repeat the operation weekly, and spray with lime-sulphur up to within a fortnight of picking.

Powdery mildew is unusually conspicuous this season. The best remedy at the present time is a sulphur spray, applied with a careful regard for the tips of laterals as well as other parts of the tree; all infected parts should be carefully removed and destroyed. The pear-slug (larva of the saw-fly) will now make its annual visitation to feed on the foliage of pear and cherry trees. In most cases the invasion is harmful, and often it is very serious; it is readily repelled, however, by an application of arsenate of lead or hellebore powder.

The apple crop is often disfigured at harvest-time by uneven colouring, caused by arsenate-of-lead spray collecting in globules and when dry forming so thick a coating as to obscure the light. This injury will be avoided and the arsenate made more effective through even distribution by the use of a "spreader." Many commercial spreaders are on the market, the chief ingredient of which is casein. It may, however, be found more economical for fruitgrowers to prepare their own spreader after obtaining the necessary ingredients.

OTHER OPERATIONS.

In the orchard a good soil-tilth should be maintained. Accidents will happen, and trees are sometimes injured by implements; such injuries should be trimmed without delay, and a coat of paint or tar applied to the wound.

The crop now maturing is rather above the average, and is likely to prove a heavy tax on the strength of the trees, especially if heavy winds and rain are experienced. Steps should be taken to afford support to trees requiring it.

Towards the end of January summer-pruning operations may be carried out, the object being to induce fertility—at the cost of vigour, of course. Some pear-trees at the age of six or seven years and many stone-fruit trees would be specially benefited by such treatment. Budding may also be put into practice at this period.

The stone-fruit harvest will now be in full swing, and last month's notes regarding picking and packing may be referred to. Dessert stone-fruit is always in short supply. For growers in close touch with a market it will pay to mature it carefully and pack it in punnets and crates.

—*W. C. Hyde, Orchard Instructor, Nelson.*

THE APIARY.

SOURCES OF LOSS.

It would appear from observations during visits of inspection that the average beekeeper is not yet alive to the advantages that would accrue to him if he gave his bees all the required attention. Beekeepers frequently complain that their bees are swarming too freely, and on investigation it is found in the majority of cases that the bees have not been given sufficient comb-room, or that an excluder has been used and the sections or extracting supers placed immediately above, without any baits or frame of brood to attract the bees upward.

Sometimes the condition of the combs in the brood-chamber is at fault; narrow strips of foundation have been used instead of full sheets, and the bees have built an excess of drone-comb. The brood-chamber is often spoilt by a frame of foundation breaking down; the wedge which secures the foundation is not pressed in sufficiently, and the foundation, as a result, comes away from the top bar, falls over, and spoils the comb next to it. Laying-workers or drone-laying queens are allowed to remain in the hive until the colony dies, thus rendering otherwise good worker-combs into drone-combs. A drone-laying queen should be destroyed immediately it is found. Laying-workers are best disposed of by shaking them off the combs anywhere in the apiary, and leaving the bees to find a home with other colonies.

Very frequently there are not sufficient combs in the brood-chamber. Failing to recognize that the projections on the end bars of the Hoffman frame are a self-spacing device to keep the frames the right distance apart, the unobservant bee-keeper puts only six or seven frames in the brood-chamber, placing them some distance apart with the object of giving the bees more room. The bees dislike any greater space than a natural bee-way between the combs, so in a hive in which there are insufficient frames the combs are drawn out at the top unduly thick, or pieces of natural comb are built in between. The result in either case is the same: the vacant spaces are filled, but not with good, straight, worker-brood combs that would give the beekeeper an ever-increasing army of harvesters bringing in large crops of surplus honey.

It is admittedly difficult, in the course of time, to put ten Hoffman frames into the brood-chamber, owing to the accumulation of propolis and other foreign matter on the end bars; but if on this account only nine frames are used the frames should be kept close together, and a division-board inserted in place of the tenth frame. The accumulation of foreign matter on the edges of the end bars

is a serious objection to the Hoffman frame. The staple-faced frame with a $1\frac{1}{16}$ in. top-bar is preferable. We cannot, however, recommend any beekeeper who already has a large number of Hoffman frames in his apiary to make the change. To sum up our observations in this regard we should say: See that you have the full complement of frames in the brood-chamber, and that they contain good straight worker-combs.

Foul-brood.

Another source of loss is found in the half-measures frequently adopted in dealing with foul-brood. Foul-brood, unfortunately, is all too common in some parts, and in consequence the beekeeper may at any time have a visitation. No one, however, should look upon foul-brood as a necessary evil—it can be cured. It is unknown in some parts of New Zealand, some apiarists who have been keeping bees for ten years or more having never seen it. Other districts that have in the past been infested with the disease are now free from any sign of infection.

There is, therefore, no excuse for the presence of foul-brood in apiaries situated in open country; its presence is explained by carelessness on the part of the beekeeper. There is no remedy for American foul-brood superior to the McEvoy treatment, which has been frequently described in the pages of the *Journal*, and is more fully dealt with in the Department's Bulletin No. 1, "Foul-brood in Bees," which can be obtained free on application. Carelessness in dealing with foul-brood must result in heavy losses, and eventually in the destruction of the whole apiary. Make a point of treating any colonies found to be infected; though there may be only a few cells of disease showing, the infection is there, and it is not safe to trust to any method less than the full McEvoy treatment. On no account put supers on infected colonies; it is but increasing the quantity of material that must eventually be destroyed to ensure the eradication of the disease. Keep your bees free from disease—it pays.

Old Queens and Poor Strains.

Still another source of loss is the presence of old queens and poor strains of bees. It pays to Italianize, and, if the beekeeper is not breeding his own queens, young queens should be purchased every alternate year and introduced in the autumn. Immediately after the close of the main honey-flow is the best time to requeen. If it is intended to raise the queens, cells should be started by one of the approved systems, to fall due about the second week in February.

One of the simplest methods of queen-rearing, when a large number is required, is that described in Bulletin No. 55 ("Bee-culture") as the Dines method. An empty comb is placed in the colony containing the queen from which it is intended to breed. When full of eggs it is placed upon a table, and two out of every three rows of eggs, and two out of every three cells in the remaining rows, are destroyed. A colony is prepared to receive this prepared comb by depriving it of its queen and all unsealed larvæ and eggs. An empty frame is then placed horizontally on the top of the frames, the prepared frame of eggs placed on this empty frame, and the whole covered with the mat. This should result in a "take" of at least fifty good queen-cells.

EXTRACTING.

Notes on extracting will appear next month. In the meantime containers should be obtained.

—*H. W. Gilling, Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

THE principal advance work for the next few weeks will be planting for autumn and winter crops. The plants set out should include the various sections of broccoli, cauliflower of the Autumn Giant type, brussels sprouts, cabbages, savoys, kale, and leeks. Planting should begin with leeks, the cauliflower mentioned, brussels sprouts, and early broccoli. The others should follow on as quickly as possible, all being got out before the end of January.

Brussels sprouts are not a success unless they have a long season of growth; they should, if possible, be planted before the end of the year. Space them 30 in. apart in rows 36 in. apart, in well-manured soil. The sprouts are formed in the axils of the leaves, and the leaves themselves should be preserved until they die. This is mentioned because some people think the leaves should be cut off to stimulate the growth of sprouts; it would, however, have an opposite effect.

Planting the members of the Brassica tribe mentioned above should not be left till rain has moistened the soil; it is much better to get the plants in before rain. They then will have got some root-hold, and a fall of rain will push them into growth right away. Where the soil is dry some means must be taken to give them a start. For small plantings the old plan of puddling-in is the best. This method is to make a hole with a dibber, fill the hole with water, plunge the roots of the plant into the water, and immediately return the soil. The soil mixed with the water makes a puddle; the operation is finished by adding a covering of dry soil, which protects the puddle from the sun. Moisture is retained long enough to start the plants into new growth.

Where large areas are planted puddling-in would be impossible. The method adopted by market-gardeners in some districts is recommended. The implement used is a hoe made for the purpose, somewhat like an adze but with a straight blade, the handle about 15 in. long. The lines for planting are defined by a marker. The plants are usually placed in a shallow box, which is dragged along by the left hand of the workman. With the hoe in his right hand the workman first scratches off the dry surface soil, and then drives the hoe in by a smart blow. The handle of the hoe is then depressed toward the worker, bringing forward the top of the blade and leaving a space at the back. The roots are inserted in this space, the hoe withdrawn, and a slight punch with its heel given to firm the soil.

The usual custom is to plant in the afternoon; two men will plant five thousand in four hours. The plants are lifted in the morning, and placed with their roots in water in iron washing-tubs or wherever most convenient. In two or three hours the leaves will have taken up all the water they can absorb. When taken for planting they are lifted in handfuls, a handful of mud from the bottom of the tub being taken and rubbed over the roots to protect them from the sun while planting. The land planted is, of course, of a suitable character, and well cultivated and consolidated. The plants grow away without any other attention except cultivation.

In the warmer districts planting of celery can be continued till the middle of February; in all other places it should be finished as soon as possible. Planting later than early January would only result in poor heads.

To get good samples of leeks planting should be done at once. Later planting is sometimes useful to supplement main crops, but results are not so good. Deep and good soil is necessary, and plenty of manure, as probably no plant takes more out of the soil than do leeks. A fair amount of humus is needed, stable or farmyard manure being the best form to apply. If artificials are relied on a mixture of superphosphate, bonedust, and sulphate of potash will answer. These should be mixed in the proportion of 2 oz. each of super and bonedust to 1 oz. of sulphate of potash, and 4 oz. of the mixture applied per square yard, forking fairly deeply into the soil. When growth has fairly started after planting a dressing of nitrate of soda should be given. This may be strewn along the drills, at about 1 oz. to 2 yards of drill. An application of nitrate of soda will be a good investment, whatever other manure or fertilizers may have been used.

To plant, draw deep drills with a hoe and plant with a dibber along the bottom of the drill. The plants should be a good size, to allow for deep planting. Thrust the dibber down its full length, and with a circular twist increase the diameter of the hole. Insert the plant its full length, and then lift it a few inches to straighten the roots. Thrust the dibber into the soil again a few inches from the hole, but pointing slightly towards it, then, by bringing the top of the dibber towards the hole, press the soil firmly against the full length of the plant. Personally, I prefer not to trim either the roots or the tops, believing growth starts quicker by not doing so.

A dwarf variety of peas may be sown early in January, the last for the season in most places. French beans may be sown up to the middle of February.

—W. H. Taylor, Horticulturist.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

SHEEP GRAZING ON LUCERNE.

COLIN MCINTOSH, West Eyreton :—

My ewes grazing on the lucerne-fields do not seem contented, although there is an abundance of feed, and they are left only a few days at a time in one field before being changed to another. I notice that they have the bark stripped off all the gorse-sticks in the fences that they can reach, as if there is something lacking in the diet of lucerne alone. Can you suggest the reason for this or a remedy ?

The Live-stock Division :—

The opinion has been formed that although your lucerne looks healthy and makes a fair growth there is a lack of available mineral salts in the plants, such as either phosphates or potash. It has been noticed that when these salts are not available animals grazing on the plants either fail to thrive, or they endeavour to satisfy the craving for the salts by eating anything within reach which does satisfy this craving. Again, lucerne is a food which contains a high percentage of albuminoids, and it is known that foods too high in albuminoids cause similar conditions to those when albuminoids are too low for tissue-nutrition. Lucerne alone is not a balanced ration, and to obtain the best results it should be supplemented by other foods. The advice is either to have a certain amount of hay or chaff available for sheep, or to have a run-off, so that the sheep can feed on grass pasture and also have free access to the lucerne. Or it might be advisable to run the mower over portions of the paddock and allow the cut material to dry for a few days. This dried material might be sufficient to counteract the excessive succulence of the lucerne, and also supply the lack of mineral matter.

DODDER IN GRASS-PADDOCKS.

M. M. GIBLIN, Richmond :—

In April, 1921, I laid down an area in clovers and permanent grasses, and since shutting up a portion for hay I find that there is dodder in about thirty places to the acre, some patches being about 10 ft. in diameter. The other portion of the paddock is eaten down fairly closely, making the weed hard to find. Could you kindly advise me the best way to get rid of the dodder ?

The Agricultural Instruction Service :—

In ordinary pasture that is being grazed dodder is of little consequence. Ordinarily at the time of haying the seed is immature, so that there should be little danger of spreading the plant through haymaking. It would probably be wiser, however, not to shut up for hay next year any paddocks which contain dodder, but to graze them in the ordinary way.

CALVES WITH LUNGWORM.

"LYSOL," Brunswick :—

I have had five calves die this season just when they were about two months old. The trouble started with a cough, then they began to pant or puff, got very poor in condition, and died about a fortnight after the first symptoms. I examined them after death, and in all cases the tubes in their lungs were literally blocked up with white worms about 2 in. long and about the thickness of ordinary sewing-cotton. The calves have always had good shelter. I should be glad of advice.

The Live-stock Division :—

Your calves were evidently suffering from verminous bronchitis caused by the presence of a worm, *Strongylus filaria*. When this is seen in the early stages each calf should be given a teaspoonful of turpentine well shaken up in two tablespoonfuls of milk, and the dose repeated in six or seven days. Increase the dose of turpentine for older calves. The calves should be given plenty of good nourishing food. It would be advisable to change the pasture at once. If the calves are housed or in yards, thoroughly clean the buildings or yards. Dig up the earth floor, and mix the earth with lime. Limewash the walls and posts, &c.

FEEDING MOLASSES TO STOCK.

J. Duschenski, Shannon :—

Will you kindly advise me as to the best and most profitable way to feed molasses to pigs, calves, and cows, and the amount to be given to each? The pigs are of all ages. Also state if this is a good fattening-food.

The Live-stock Division :—

Molasses is not a specially good food for pigs. It should be given with other foods, and used very sparingly at first. Its fattening-value is not great in itself, but it is used largely to increase the palatability of inferior food. The quantity given must be regulated according to age, &c., and also how the animal stands it. A quantity which would have little effect on one pig may scour another very badly. The same precautions must be taken in the case of cows and calves. Feed the molasses carefully, and watch the result on the bowels. Here, again, its best value is as an adjunct to dry feed.

SEAWEED AS A MANURE.

H. S. Stratford, Pelorus Sound :—

Would you inform me of the constituents and manurial value of seaweed, and how this is best applied to the land?

The Agricultural Instruction Service :—

The main varieties of seaweed washed up on the New Zealand coast are *Macrocystis* and *Durvillaea*. The main difficulty in the way of the utilization of seaweed for manurial purposes is that it takes some time to decompose. Prior to utilization it is well to cover it with sand or other soil for some months and allow it to stand. Average seaweed contains about as much nitrogen as farmyard manure, but, since it is present as relatively slow-acting organic nitrogen, it is scarcely so valuable as in average dung, in which a certain proportion is present in the active available form of soluble ammonia compounds. As seaweed decays in the soil, however, some of its nitrogen becomes available. Probably the most important constituent of seaweed, however, is potash. The stems of fresh seaweed contain about 82 per cent. water, 12 per cent. organic matter, 0·25 per cent. nitrogen, and 1·83 per cent. potash, as well as about 1 per cent. phosphoric acid. Average dried seaweed contains 5 per cent. potash, 2½ per cent. nitrogen, and 1¼ per cent. phosphoric acid.

LATE APPEARANCE OF TESTICLES IN COLT.

J. N., Woodlands :—

I have a colt foal, twelve months old, in which as yet there is no appearance of testicles. Would a veterinarian be able to castrate him later on if the testicles are still not showing?

The Live-stock Division :—

It is quite usual for a colt foal not to have any appearance of testicles at one year, while by keeping him for another year they may be quite visible, and easy to operate on. Even then, if they do not descend into the scrotum, a veterinary surgeon can operate in the usual way for rigs.

SELF-SUCKING COW.

H. D. McCULLY, Tiakitahuna :—

Could you tell me if there is any cure or good preventive method for a cow that sucks herself ?

The Live-stock Division :—

To prevent the cow sucking herself, fix a halter on her head and a surcingle round her girth, then fasten a broom-handle or similar piece of wood between the halter and the middle of the surcingle. This will prevent her turning her head round far enough to suck herself. The contrivance may have to be left in position for four to six weeks before the habit is broken.

DOCKING OF LAMBS.

"WHANAKURA," Hastings :—

I would appreciate advice regarding the docking of lambs, particularly as to whether the knife or the searing-iron is the better method. Also, would the loss of blood when the knife is used arrest the growth of lambs intended for early freezing ?

The Live-stock Division :—

It is a matter of opinion whether the knife or the searing-iron should be used. Some owners use the knife, some the iron, and occasionally a combination of both is used. In many cases, where the lambs are in a too plethoric condition, the amount of blood lost through the use of the knife is beneficial. In any case, the small amount lost should not interfere with the growth of the lamb for early freezing purposes.

Gradings of Butter and Cheese.—Following are the official gradings of butter and cheese for November, and for the four months August-November, 1922 :—

Butter: November, 192,490 cwt. (178,114 cwt. salted, 14,376 cwt. unsalted) ; increase compared with corresponding period of 1921, 27·88 per cent. Four months August-November, 518,099 cwt. (479,856 cwt. salted, 38,243 cwt. unsalted) ; increase over 1921 figures, 54·04 per cent.

Cheese: November, 161,771 cwt. (100,285 cwt. white, 61,486 cwt. coloured) ; decrease, 6·25 per cent. Four months August-November, 236,075 cwt. (147,732 cwt. white, 88,341 cwt. coloured) ; decrease, 24·85 per cent.

Butterfat-production: Converting into butterfat equivalent the above quantities of butter and cheese graded during the four months August-November, 1922, there is shown to have been an increase of 30·27 per cent. in butterfat-production as compared with the corresponding period of the previous season.

American Meat Trusts.—The following parliamentary question and reply is reprinted from *Hansard* of 30th October last : "Sir J. P. Luke (Wellington North) said that it had been generally stated that certain exporting firms, such as Sims Cooper, were still operating on behalf of American interests, and he asked the Prime Minister whether the investigations of the Government or the Meat Board had gone to show that such was the case, and whether the Government was prepared to take further action in the matter. The Right Hon. Mr. Massey (Prime Minister) said he was acquainted with the subject referred to by the honourable member, as it had come up some three years ago in an inquiry then being held by the Agricultural and Stock Committee. As to how the question was then raised, he was not quite clear as to whether Sims Cooper were in any way connected with the American trusts. The question was referred to him, and he set on foot the usual inquiries, and within the last six months he had convinced himself that the firm of Sims Cooper were in no way connected with any American meat trust. He was quite satisfied on that point.'

WEATHER RECORDS.

NOVEMBER, 1922.

THE following general summary and rainfall statistics are supplied to the *Journal* by the Director of the Dominion Meteorological Office (Mr. D. C. Bates) :—

Westerly or antarctic disturbances accounted for the stormy weather conditions which were rather prevalent over the first half of the month of November and again at the close, while an anticyclonic or "high" pressure system was in evidence between the 18th and 28th, and centred in the north.

Rainfall reports show that there was a rather serious deficiency on the east coast of the North Island southward of East Cape, Gisborne having only 44 per cent. of its average November rainfall, and Napier but 30 per cent. of its mean. What makes the position more marked is that rainfall was also below the average at these stations in the two previous months. In the table herewith Russell, Thames, Masterton, and Wanganui are also recorded slightly below the average, but all other places are above—for example, Kawhia (+ 3·67 in.), New Plymouth (+ 3·90 in.), Opunake (+ 3·93 in.), and Collingwood (+ 1·95 in.). In the South Island only three out of the twenty-two rainfall-station records supplied to the *Journal of Agriculture* have totals slightly below the mean for the month. The surplus on the east coast (South Island) should make up for some of the deficiency caused by the dry nor'-westers which have been so troublesome in the past month or two.

RAINFALL FOR NOVEMBER, 1922.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
North Island.	Inches.		Inches.	Inches.
Kaitaia	4·60	10	1·68	3·27
Russell	1·54	11	0·30	1·61
Auckland	3·66	17	0·72	3·26
Hamilton	5·12	14	0·80	4·05
Kawhia	8·16	17	1·74	4·49
New Plymouth	8·48	20	2·41	4·58
Inglewood	12·64	18	1·40	8·93
Whangamomona	10·68	21	1·86	7·40
Tairua, Thames	3·08	12	1·14	3·55
Tauranga	4·14	14	0·78	3·21
Maraehako Station, Opotiki ..	2·94	11	0·88	2·78
Gisborne	1·40	8	0·54	3·15
Taupo	4·86	12	1·76	3·41
Napier	0·78	8	0·26	2·60
Taihape	4·70	17	0·84	3·67
Masterton	2·57	17	0·32	2·87
Patea	7·65	14	1·75	3·72
Wanganui	3·28	9	0·65	3·31
Foxton	5·46	11	1·30	3·63
Wellington	5·42	16	0·96	3·47
South Island.				
Westport	8·97	22	1·89	7·08
Greymouth	10·76	20	2·58	9·46
Hokitika	13·08	22	1·86	10·68
Arthur's Pass	18·24	20	3·05	15·00
Okuru, Westland	16·94	22	2·16	12·96
Collingwood	8·73	19	1·81	7·68
Nelson	4·02	14	1·18	2·84

RAINFALL FOR NOVEMBER—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Spring Creek, Blenheim	2·72	14	0·48	2·41
Tophouse	6·44	21	1·61	7·07
Hanmer Springs	3·30	12	0·94	2·91
Waiau	2·30	10	0·54	2·39
Gore Bay (North Canterbury) ..	2·13	8	0·70	1·98
Christchurch	3·24	13	1·39	1·84
Timaru	3·84	17	1·06	1·97
Lambrook Station, Fairlie ..	4·04	9	1·86	2·00
Benmore Station, Omarama ..	2·12	13	0·78	2·05
Oamaru	2·57	12	1·09	1·94
Queenstown	2·53	15	0·38	2·77
Clyde	1·56	10	0·61	1·36
Dunedin	4·94	21	1·04	3·27
Gore	4·88	25	0·60	3·08
Invercargill	5·56	25	1·34	4·56

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A REMINDER is given of the annual meeting of this association to be held at Victoria College, Wellington, opening on 9th January, 1923, under the general presidency of Mr. G. H. Knibbs, Director of the Commonwealth Institute of Science and Industry. A large number of Australian members have already intimated their intention of being present, so that the success of the gathering is assured. The association seeks primarily to advance the cause of science in Australia and New Zealand by educational methods, and in order that the great work may be more effectively carried on an enlargement of the membership and consequent strengthening of the finances is highly desirable. Those interested are therefore cordially invited to register their membership and, if possible, attend the sessions.

Included within the scope of the meeting are sections of agriculture, veterinary science, biology, and chemistry, and a number of papers and addresses under each of these subjects will be given. The Agriculture Section will be presided over by Mr. A. E. V. Richardson, Melbourne; with Dr. C. J. Reakes, Wellington, as vice-president; and Mr. B. C. Aston, Wellington, as secretary. Professor H. O. Woodruff, of Melbourne, is president of the Veterinary Science Section; Mr. A. R. Young, Wellington, vice-president; and Mr. P. Haugh, Wellington, secretary.

Short excursions to places of interest have been arranged, and in the evenings there will be lectures and entertainments. Members will receive a copy of the report of the association—a volume of several hundred pages containing the presidential addresses and papers read at the meeting. The New Zealand Government has conceded to members visiting Wellington to attend the conference first-class railway tickets at second-class fares. The Union, Huddart-Parker, and Anchor shipping lines have agreed to a reduction of 10 per cent. off fares to Wellington; and several motor companies have also granted concessions on fares, ranging from 10 to 25 per cent.

The subscription for the congress is £1, and should be forwarded to Professor D. M. Y. Sommerville, local treasurer, Australasian Association for the Advancement of Science, Victoria College, Wellington. The local honorary secretary, Mr. W. R. B. Oliver, Dominion Museum, Wellington, will be pleased to supply to intending members any further information regarding the meeting.

RURAL CREDIT ASSOCIATIONS ACT, 1922.

"AN Act to make Provision, by means of the Establishment of Rural Credit Associations, for affording Financial Assistance to Farmers and Rural Workers" is the full title of this measure, passed in the 1922 session of Parliament. An explanatory memorandum circulated with the Bill when introduced states as follows:—

The purpose of the Bill is to afford statutory recognition to certain classes of societies established for the mutual benefit of their members, their primary object being the making of advances to their members secured principally on chattel securities. The Bill relates only to societies that are registered under the Incorporated Societies Act, 1908. That Act provides all the necessary machinery for the incorporation of societies, the registration of their rules, the method in which they can enter into legal relationships with other persons or bodies, the alteration of the rules, the registration of members, the winding-up of societies (either voluntarily or by the Supreme Court), the distribution of assets in the event of winding-up, and matters incidental to the foregoing. By virtue of the application of the Incorporated Societies Act, 1908, and the amending Act of 1920, the registration and incorporation of a main or central society or association is permitted, and also the registration and incorporation of district or branch societies. It is at least doubtful if the Bill confers on any association of persons any powers which the association could not acquire by incorporation under the Companies Act. It is recognized, however, that the law appropriate to companies is somewhat too complex for the class of association which the present Bill has in contemplation. Clause 4: This clause enumerates the special functions of an incorporated society applying for registration as a rural credit association. The essential purpose is the advancing of moneys to members of the association out of capital moneys acquired, either by way of deposits or otherwise by way of loan. Advances to the members of the society may be either by way of cash, or by the issue of bonds payable to bearer or to order which the member may negotiate for cash. Clause 6: Members of the association are made jointly and severally liable for the liabilities of the association. It is recognized that comparatively few of the members will be the owners of unencumbered land; it is therefore provided that the liabilities constitute an equitable charge on the assets of the members, subject, however, to encumbrances existing at the time of the incorporation of the society. Clause 7: The purposes for which loans may be made to members are enumerated in this clause, and relate primarily to the occupation of land. Clause 8: Loans to any one member are limited to £500. Clause 9: Administration expenses are kept within bounds by provision for the payment of one member only (secretary and treasurer), together with an annual allowance to the chairman of the management committee.

THE ACT.

Following is the full text of the measure:—

1. This Act may be cited as the Rural Credit Associations Act, 1922, and shall come into force on the first day of January, nineteen hundred and twenty-three.

2. In this Act, unless the context otherwise requires, "association" means a rural credit association under this Act; "Registrar" means the Registrar of Incorporated Societies under the Incorporated Societies Act, 1908.

Registration of Rural Credit Associations.

3. (1.) Any society or association of not less than ten persons, but qualified in other respects to be registered under the Incorporated Societies Act, 1908, may, subject to the provisions of this Act, be incorporated under that Act, and registered under the style of "The [*Name of district or other distinctive words*] Rural Credit Association (Incorporated)."

(2.) Save as otherwise expressly provided in this Act, all the provisions of the Incorporated Societies Act, 1908 (including the provisions of the Incorporated Societies Amendment Act, 1920, for the incorporation of local branches or groups of branches of registered societies), shall apply with respect to associations registered pursuant to this Act.

(3.) The members of an association registered pursuant to this Act shall not be deemed to be associated for pecuniary gain merely by reason of the fact that the society carries on any business authorized by its rules and this Act.

Objects of Associations.

4. No association shall be registered under this Act unless its rules provide for the following matters, that is to say: (*a*) The receipt of deposits, whether from members of the association or other persons, for fixed terms or at call, either with or without notice; (*b*) the payment of interest on such deposits, at such rates as may from time to time be fixed in accordance with the rules of the association; (*c*) the authority to borrow such additional moneys as may be required by the association for the conduct of its operations; (*d*) the lending of money (either in cash or by the issue of bonds charged on the assets of the association and payable to bearer or to order) to members of the association for approved purposes, for such period or periods and at such rates of interest as may be fixed pursuant to the rules; (*e*) the purposes for which moneys may be advanced by an association to any of its members (being approved purposes within the meaning of section seven hereof); (*f*) the carrying to a reserve fund of all profits arising from the operations of the association; (*g*) the annual or more frequent audit of the accounts of the association; (*h*) the appointment of a management committee of the association and of a manager, who shall be the chairman of the management committee.

Special Provisions as to Rules of Associations.

5. Notwithstanding anything to the contrary in the Incorporated Societies Act, 1908, the Registrar shall, before registering any association under this Act, submit the rules of the association to the Minister of Finance, and shall not register the association unless and until the Minister is satisfied—(*a*) That the objects of the association as set out in its rules are appropriate to an association to be registered under this Act; (*b*) that the provisions of the rules as to the modes in which persons cease to be members of the association are not such as to prejudice the security of any creditor of the association; (*c*) generally, that the association is one that ought to be registered under this Act.

Liability of Members of Association.

6. (1.) The members of an association shall be jointly and severally liable for the full amount of all the liabilities of the association in respect of—(*a*) All loans, together with the interest and other charges thereon, raised by the association pursuant to its rules and this Act; (*b*) all deposits, with interest thereon at the agreed rate, accepted by the association from its members or other persons; (*c*) all other liabilities lawfully incurred by the association or by its management committee on behalf of the association.

(2.) The amount of all loans raised by an association pursuant to its rules and this Act (including the liability of the association under all outstanding bonds issued by the association to its members), and of all moneys accepted by an association from its members as deposits, together with all interest and other charges in respect of such loans and deposits, shall be an equitable charge on all the assets of the members of the association, save so far as any such assets of any member are by law excluded from the assets available for the payment of his debts or liabilities.

(3.) Every such charge shall be apportionable among the several loans or deposits from which it arises, and every such loan or deposit shall have priority according to the date when the association received or became entitled to receive the same. In the case of two or more sums being received or receivable on the same day the charges arising therefrom shall rank equally with each other.

(4.) Subject to the provisions of the last preceding subsection, every such charge shall, save as may be otherwise expressly provided by this or any other Act, have priority over all mortgages, charges, or encumbrances, whether legal or equitable, created after the incorporation of the association.

(5.) For the purpose of enforcing any charge created by this section the Supreme Court or a Judge thereof may, on summons, make such order as he or it thinks fit, either for the sale of any property subject to the charge or for the appointment of a receiver, or otherwise; and any order for sale shall be carried into effect by the Sheriff in the same manner as in the case of a writ of sale, with any modifications that may be necessary or may be provided by rules of Court in that behalf.

Loans to Members.

7. (1.) No advance shall be made by any association to any of its members save for one or more of the purposes following (in this Act referred to as approved purposes), namely: (*a*) The clearing, fencing, draining, and general improvement of land in the occupation of a member; (*b*) the erection of buildings on any such land; (*c*) the purchase of implements, stock, seeds, plants, trees, and other things required in respect of the occupation and use of any land; (*d*) the purchase of tools of trade; (*e*) the payment of any mortgage, debt, or other liability of the member; (*f*) any other purpose that may be declared by the Governor-General in Council to be an approved purpose within the meaning and for the purposes of this Act.

(2.) Any advance made by an association in cash to any of its members, with interest thereon at the agreed rate, shall be deemed to be a debt due by the member to the association on a date to be agreed on in that behalf, and shall be recoverable by the association accordingly in any Court of competent jurisdiction.

(3.) In addition to the personal security afforded by the last preceding subsection, the association may require from any member to whom an advance as aforesaid is made such other security by way of mortgage of real or personal property or otherwise as it thinks fit.

Limit of Amount of Advances to Members.

8. (1.) No advance shall be made by any association to any of its members pursuant to this Act so as to exceed, with all other advances theretofore made to him and then outstanding, the sum of five hundred pounds.

(2.) No advance shall be made by an association to any of its officers or to any member of the management committee, save with the consent of not less than two-thirds of the members of the association present at a general meeting of the association.

Expenses of Administration.

9. (1.) There may be paid by an association to not more than one of its members such sum as may be determined by the management committee in respect of the services of that member as secretary or treasurer of the association, or as both secretary and treasurer thereof.

(2.) There may also be paid to the chairman of the management committee an annual or other allowance to be approved at a general meeting of the association, and a refund of his travelling-expenses actually and reasonably incurred in connection with the business of the association.

Regulations.

10. The Governor-General may from time to time make all such regulations as he may deem necessary for the purpose of carrying into effect the provisions of this Act.

Bone-char.—Burning bones at a red heat does not result in appreciable loss of phosphoric acid, and enables the bones to be crushed to a powder, to which they must be reduced before the phosphate is of value as a soil-dressing.

Estimates of Areas under Oats.—In giving the estimate of areas under wheat and oats this season the Government Statistician remarks that experience has shown that the results in the case of oats have been generally underestimated. The system of estimation (based on a card census through the post) does not appear to apply quite so well as in the case of wheat, where the variation of the estimated from the final result is much smaller.

LIVE-STOCK IN NEW ZEALAND: 1922.

Unless otherwise specified, the enumeration is at 31st January.

Land District.	Horses.	Asses and Mules.	Cattle (including Dairy Cows).	Dairy Cows.		Number of Sheep shorn, 1921–22.	Number of Lambs tailed, 1921–22.	Sheep (including Lambs) as at 30th April, 1922.	Pigs.	Goats.	
				In Milk.	Dry.					Angora.	Other.
North Auckland ..	37,754	60	463,089	147,893	19,627	656,470	253,641	632,965	54,250	918	1,261
Auckland	48,693	17	650,121	244,172	26,937	890,091	374,905	818,691	90,640	745	1,514
Hawke's Bay.. ..	34,523	83	495,638	50,721	8,744	5,008,452	2,262,368	5,203,294	22,954	1,047	647
Taranaki	22,146	20	375,187	174,181	13,876	806,434	325,636	674,509	48,792	431	4,136
Wellington	44,169	28	650,135	157,569	18,963	4,724,578	2,269,758	4,857,592	55,337	1,228	497
Nelson	7,936	3	62,774	22,939	3,317	423,291	159,970	448,415	12,516	995	1,157
Marlborough	7,274	3	47,176	14,172	2,147	1,015,947	389,958	1,031,111	7,775	326	2,149
Westland	2,730	..	44,369	10,172	2,371	52,677	28,526	56,675	4,266	26	82
Canterbury	63,515	29	212,328	79,515	10,510	3,839,135	2,322,648	4,301,838	56,588	182	68
Otago	35,917	19	142,517	48,240	8,360	2,459,573	1,131,463	2,813,044	18,373	3	27
Southland	27,448	4	179,889	65,751	6,878	1,223,902	749,028	1,384,125	12,842	3	38
Dominion totals ..	332,105	266	3,323,223	1,015,325	121,730	21,100,550	10,267,901	22,222,259	384,333	5,904	11,576
Totals, 1921 ..	337,259	245	3,139,223	890,220	114,446	21,923,009	9,614,548	23,285,031	349,892	5,533	11,834

THE SEASON'S LAMBING.

FOLLOWING are complete estimates of the current season's lambing, computed from estimated average percentages furnished by the Department's Inspectors of Stock in the various districts. Corresponding figures for the three previous years, together with the actual numbers of lambs tailed, are also given for comparison.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
		NORTH ISLAND.		
1922 ..	6,771,482	90·36	6,118,530	..
1921 ..	6,312,456	89·65	5,659,355	5,457,643
1920 ..	5,838,704	87·95	5,135,524	5,074,751
1919 ..	6,311,797	81·57	5,148,779	5,120,000
		SOUTH ISLAND.		
1922 ..	5,724,572	82·53	4,724,475	..
1921 ..	5,835,332	83·28	4,859,425	4,810,258
1920	5,729,845	80·20	4,595,426	4,539,797
1919 ..	5,996,709	72·23	4,331,883	4,326,385
		DOMINION.		
1922 ..	12,496,054	86·77	10,843,005	..
1921 ..	12,147,788	86·59	10,518,780	10,267,910
1920 ..	11,568,549	84·11	9,730,950	9,614,548
1919 ..	12,308,506	77·02	9,480,662	9,446,385

FORTHCOMING AGRICULTURAL SHOWS.

Tuapeka Agricultural Society: Lawrence, 26th December.
Wairoa County A. and P. Society: Wairoa, 17th January.
Woodville A. and P. Association: Woodville, 23rd and 24th January.
Helensville A. and P. Association: Helensville, 29th January.
Pahiatua A. and P. Association: Pahiatua, 9th February.
Te Puke A. and P. Association: Te Puke, 9th February.
Buller A. and P. Association: Westport, 9th and 10th February.
Northern Wairoa A. and P. Association: Mititai, 9th and 10th February.
Clevedon A. and P. Association: Clevedon, 10th February.
Rodney Agricultural Society: Warkworth, 10th February.
Dannevirke A. and P. Association: Dannevirke, 14th and 15th February.
Waimarino A., P., H., and I. Association: Raetihi, 15th February.
Wellsford A. and P. Society: Wellsford, 16th February.
Masterton A. and P. Association: Masterton, 20th and 21st February.
Te Awamutu A. and P. Association: Te Awamutu, 21st February.
Omaha and Pakiri A. and H. Association: Leigh, 21st February.
Rangitikei A. and P. Association: Taihape, 22nd February.
Opotiki A. and P. Association: Opotiki, 23rd February.
Franklin A. and P. Society: Pukekohe, 23rd and 24th February.
Rotorua A. and P. Association: Rotorua, 28th February.
Katikati A. and P. Society: Katikati, 1st March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 7th and 8th March.
Waikato Central Agricultural Association: Cambridge, 7th and 8th March.
Morrinsville A., P., and H. Society: Morrinsville, 14th March.
Methven A. and P. Association: Methven, 15th March.
Temuka and Geraldine A. and P. Association: Temuka, 22nd March.
Matamata A. and P. Association: Matamata, 22nd March.
Mayfield A. and P. Association: Mayfield, 24th March.